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FINANCIAL ANALYSIS OF ATLANTIC SALMON FARMING IN BRITISH COLUMBIA

Economic and Commercial Analysis

Report No. 95

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FINANCIAL ANALYSIS OF ATLANTIC SALMON FARMING IN BRITISH COLUMBIA

A Computer Based Model Approach

Ecomomic and Commercial Analysis Division

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ABSTRACT

A computer model of salmon farming economics was developed and described in a previous report entitled "Financial Analysis of Salmon Farming in Coastal British Columbia" (Department of Fisheries and Oceans, Economic and Commercial Analysis Report No. 54). This report describes the utilization of that model to provide an updated view of chinook salmon farming and an analysis of Atlantic Salmon farming in British Columbia.

The report begins with a detailed description of the steps necessary to update the previous model. As these steps are taken, a description of the changes in the typical chinook salmon farm and relevant industry changes, such as declining prices and technological changes are provided. In the second part a similar process is followed to develop a computer model of an Atlantic salmon farm. A discussion of the major differences between Atlantic salmon farming and chinook salmon farming is included as the model is changed to represent an Atlantic salmon farm.

Finally, an illustration of the model's use as a policy analysis tool is provided as a "best case" Atlantic salmon farm is modeled.

For a copy of the previous report or a copy of the model, please contact Peter Leitz at (604) 666-6570.

RÉSUMÉ

Un modèle informatisé pour l'économie d'élevage du saumon a été mis au point et décrit dans un précédent rapport intitulé "Financial Analysis of Salmon Farming in Coastal British Columbia" (Pêches et Océans Canada, Economic and Commercial Analysis Report n° 54). Ce rapport décrit l'utilisation dudit modèle pour l'obtention, d'une part, de données récentes sur l'élevage de saumon quinnat et, d'autre part, d'une analyse de l'élevage de saumon de l'Atlantique en Colombie-Britannique.

Le rapport commence par une description détaillée des étapes nécessaires pour mettre à jour le modèle précédent. À mesure que ces étapes sont franchies, on donne une description des modifications apportées à la ferme d'élevage type de saumon quinnat, ainsi que des modifications connexes dans l'industrie, comme la baisse des prix et les changements technologiques. Dans la seconde partie du rapport, un processus semblable est utilisé pour mettre au point un modèle informatisé pour l'élevage de saumon de l'Atlantique. On examine les principales différences entre l'élevage de saumon de l'Atlantique et celui de saumon quinnat à mesure que le modèle est modifié pour représenter une ferme d'élevage de saumon de l'Atlantique.

Enfin, on donne une illustration de l'emploi du modèle comme outil d'analyse des politiques en tant que "meilleur cas" de modèle de ferme d'élevage de saumon de l'Atlantique.

Pour une copie du rapport précédent ou du modèle, veuillez communiquer avec Peter Leitz en composant le (604) 666-6570.

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The information presented is a compilation of the data and insight obtained from these individuals and from the experience of the authors. The results, therefore, do not reflect the operating performance of any individual farm or company.

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INTRODUCTION

This report is an update and expansion of the Department of Fisheries and Ocean's Economic and Commercial Analysis Division report #54, entitled FINANCIAL ANALYSIS OF SALMON FARMING IN COASTAL BRITISH COLUMBIA - a Computer-based Model Approach.

The original report was prepared in the winter of 1989, before the salmon farming industry suffered a period of low sales prices that resulted in a number of bankruptcies and structural changes to the industry. This report provides an overview of the effect of this price drop and other changes on the industry's financial performance. It also reviews the latest information available on the biological performance of commonly farmed stocks.

The report begins with a step by step walk through the STANDARD farm model (from the first report) as the computer program's cost and production variables are modified to reflect current expectations. The new farm model generated is referred to as the EXAMPLE CHINOOK farm model (File name: Chinook.wk1).

The development of the EXAMPLE CHINOOK farm model acts as a review of the program structure and of the nature of inputs to it. However, it is assumed that the reader has a thorough knowledge of, or access to, the original report. Both the original report and this one are intended to act as a manual and tutorial for the program.

Part II of this report is the first, in what we hope will be a series, of applications of the program in the analysis of the economics of salmon farming in B.C.. In Part II the economics of Atlantic salmon farming are reviewed. The differences between Atlantic and chinook salmon farming economics are highlighted as inputs and data for the EXAMPLE CHINOOK farm are modified to represent reasonable expectations for the EXAMPLE ATLANTIC farm (File name: Atlantic.wk1).

As with the original report of March 1989, the EXAMPLE farms do not represent industry averages. Instead they are meant to serve as reasonable examples of well managed, moderate to small sized farms with costs indicative of the Campbell River region.

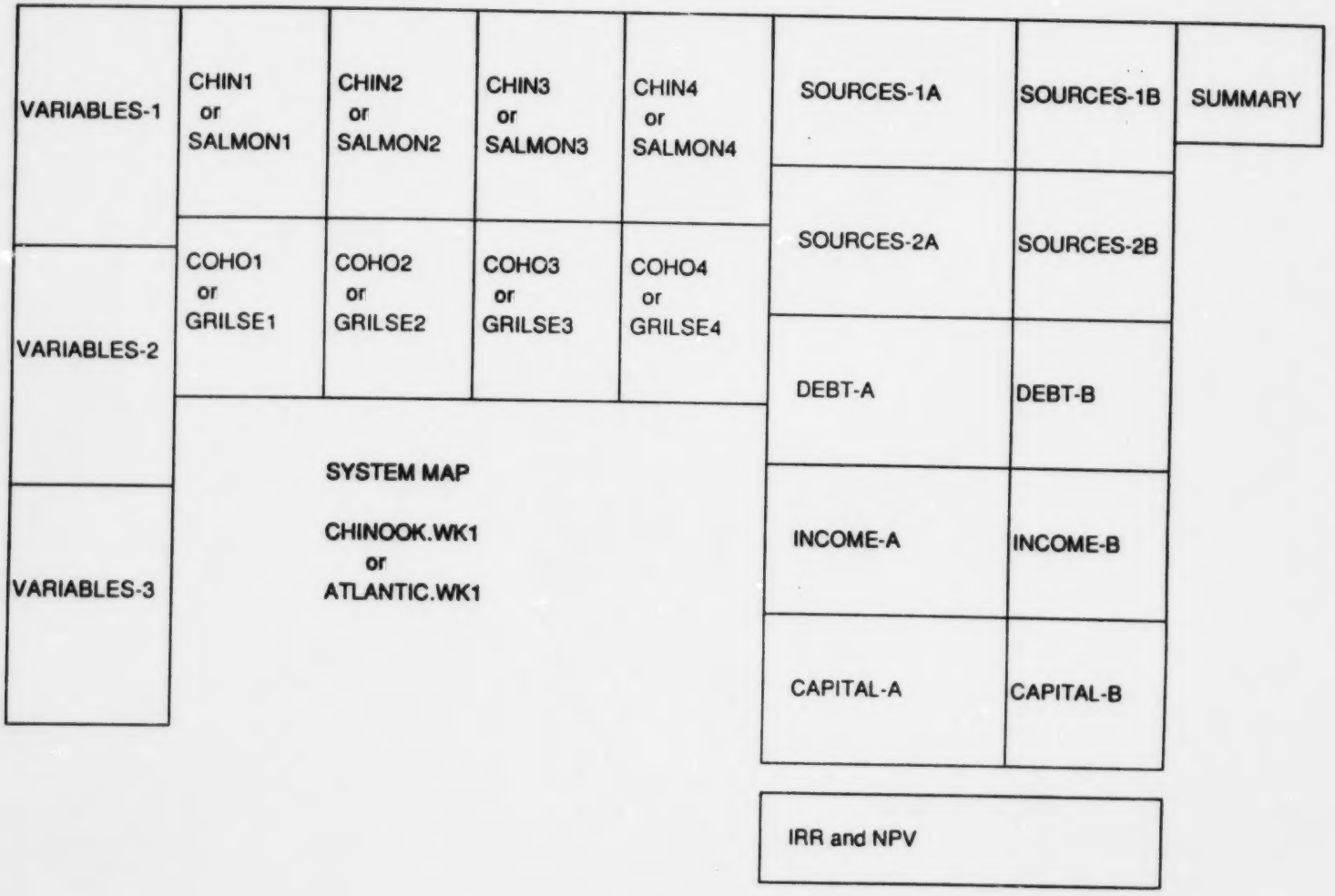
In Part III, the economics of chinook versus Atlantic salmon farming are compared and the overall cost expectations of this study are compared with the original study's findings. This is followed by a brief analysis of why there is growing interest in Atlantic salmon farming in B.C., and of the potential that Atlantic salmon have for decreasing the cost of production in B. C..

Finally, the major issues that have been highlighted by the study are reviewed and some potential areas for additional work and research are identified.

The reader is reminded that the computer program on which this study is based was designed to permit sensitivity analyses. All production and cost factors are flexible and most are self-calculating based on several 'factors' that are set by the analyst. The model generated using settings that differ by more than 30% of the settings used in the EXAMPLE farms should be viewed with caution. For scenarios beyond these limits, a variety of settings should be altered in concert to simulate a new EXAMPLE farm.

The computer model is quite large. It takes up approximately 360K of RAM and operates in the LOTUS environment on IBM compatible computers. The calculation time on an 'XT' computer is approximately 45 seconds.

The reader is more likely to benefit from this report if it is treated as a tutorial on the use of the model. It is recommended that the model be on the screen and available when reading the report. A map of range names has been provided overleaf to help in navigating around the spreadsheet. The top name refers to the pages of the program Chinook.wk1 (Appendix 1). The bottom name refers to the pages of the program Atlantic.wk1 (Appendix 2).


VARIABLES-1
VARIABLES-2
VARIABLES-3
CHIN1 or SALMON1
CHIN2 or SALMON2
CHIN3 or SALMON3
CHIN4 or SALMON4
COHO1 or GRILSE1
COHO2 or GRILSE2
COHO3 or GRILSE3
COHO4 or GRILSE4
SYSTEM MAP
CHINOOK.WK1
or
ATLANTIC.WK1
SOURCES-1A
SOURCES-1B
SUMMARY
SOURCES-2A
SOURCES-2B
DEBT-A
DEBT-B
INCOME-A
INCOME-B
CAPITAL-A
CAPITAL-B
IRR and NPV

PART I: UPDATED CHINOOK MODEL

Since the original description of the model was completed in March of 1989, there has been a substantial drop in fresh salmon prices and a large number of fish farm receiverships as a consequence. The overall effect on the industry has been to eliminate the highest cost producers in the industry. This contraction in the size of the industry has resulted in the leanest and best run farms surviving. A decrease in the cost of inputs, such as feed and equipment has also helped to decrease the industry's cost of production.

The farm that was originally modelled, called the standard farm, was typical of many of the farms financed by Norwegian banks in that capital expenditures were generous by current standards and there was a high level of debt (50% of peak requirement). The standard farm would not have been among the more extravagant or less efficient farms at the time, but would probably not have survived until now nonetheless. This is because the loan repayment requirements could not be met during a period of low prices.

The standard farm had a large proportion of short term financing which typified that provided by the Norwegian banks. This involved a two year grace period from principal repayment and then very rapid repayment in years three to five. With the drop in sales prices, highly levered, and some moderately levered companies were unable to make interest payments, much less principal payments. With economic problems back in Norway, poor financial performance of farms in Canada could not be sustained by Norwegian banks.

The low prices in the last three quarters of 1989 and first quarter of 1990 were as much as one-third lower than those prices used in the model that is described below. These prices (e.g. $2.50/lb or $5.50/kg F.O.B. Vancouver for the 4 to 6 pound range) were below the cost of production (C. O. P.) of all but a very few farms.

The price drop was likely due to large production of salmon in Alaska as well as significant growth in the farmed salmon industry in Norway and other parts of the world. Unfavourable exchange rates were also a factor for Canadian producers. The lowered prices for salmon and other seafood has led to a significant jump in seafood consumption in the U. S. A.. The market now appears to have stabilized at prices for 4 to 6 pound fish (outside of the summer season) around $3.50/lb or $7.70/kg F.O.B. Vancouver. This is still not high enough to support what were the highest cost producers of 1989. Many of these farms have been through a receivership and are now working with much less debt and devalued capital assets.

The receivership of these companies was, therefore, largely due to their inability withstand creditor demands during the period of low prices. The STANDARD farm, which was lavish by today's standard, would be marginally profitable at current prices.

The period of low prices has forced most farms, and indirectly most suppliers, to be more cost conscious. Thus, many of the inputs to the EXAMPLE farm described below can be set at a lower cost level, than they were for the STANDARD farm described in the original report.

The "EXAMPLE" farm is meant to be representative of a well run, lean operation of moderate to small size, operating in the Campbell River region.

PROGRAM MODIFICATIONS

The discussion that follows uses the format of the original report. Changes to the costs and assumptions inherent in the "STANDARD" farm model are highlighted in the order that they appear in the original description of the model.

Species Farmed

The B.C. salmon farming industry is now dominated by monosex chinook salmon. Coho are relatively unpopular and hormonally feminized chinook are nonexistent. Of the 23 million chinook smolts stocked to the sea in 1989, 51 percent were regular sex and 42 percent were monosex. Only 7 percent were hormonally feminized. For 1990 recent estimates (August, 1990) put the total number of smolts stocked in B.C. at 17 million. Of these, 13.5 million were chinook, 0.8 million were coho, and 2.4 million were Atlantics. Of the 13.5 million chinook, 9.5 million, or 70 percent, were monosex.[1] The percentage may even have been higher if there had been more abundant monosex milt.

The EXAMPLE farm, therefore, is presumed to rear only monosex chinook, as is typical of many B.C. farms.

The coho production statements have been left essentially blank in the program so as not to affect the results. This is done by introducing a zero on line 7, under the 'Number of Smolts Stocked', on the VARIABLE-1 page.

---

[1] Al Kenny, B. C. Salmon Farmers Association

The number 1 has been introduced as the factor for most other coho factors on the VARIABLES pages, to simplify reading the tables and charts.

Farm Size

The EXAMPLE farm stocks 150,000 smolts each spring. This is smaller than the STANDARD farm which had an additional 100,000 coho smolts each year. The smaller size of the EXAMPLE farm is indicative of a trend towards starting fewer smolts on a farm. After a period when every pound of small fish sold lost money, farmers are more concerned with raising fewer, larger fish.

A farm size of 250,000 smolts is assumed to approximate an industry average as there seem to be very large, corporate farms which stock in excess of 500,000 smolts per year per site and small to moderate size farms, which stock 75,000 to 200,000 smolts per year. The EXAMPLE farm (with 150,000 smolts/year) is therefore of moderate scale relative to what exists in the industry today.

Stocking Date

The STANDARD model assumed good management and good smolts. For the purpose of this model, there has not been any change in what constitutes a good smolt since the original report was written. Therefore, the EXAMPLE farm has the same stocking date of May 30, and the same stocking weight of 7 grams.

If there has been a change in the hatchery side of the salmon farming industry over the past year, it is that a period of overcapacity has resulted in virtually every farm being able to obtain good chinook smolts of the type and quantity they desire.

Biomass

Under the heading of biomass in the original report was a discussion of the "growth curve" that forms the backbone of the model's forecasts. This growth curve appears in numerical form, on the production statements under column 5A and is entitled "Real Average Weight". It is presented graphically as figure 4, following the discussion of Life History.

Typical performance reported by farms currently is slightly better than the typical performance presented in the STANDARD model of March 1989. In the STANDARD model the critical two kilogram average weight was reached at the end of January of the second year, after 21 months of growth. In the EXAMPLE model, the two kilo mark is reached at the end of December, after only 20 months of growth. Since the objective of all farmers is to grow the biggest fish the fastest, this represents a significant improvement.

The updated growth curve represents what is likely to be the average on a farm with many stocks performing differently. Such an average would be considered good for the Campbell River region by most standards and therefore represents the results for a farm that is well run.

It is interesting to note that some farms claim to be able to reach the two kilo average weight by August or September, after only 17 or 18 months of growth. This kind of performance, similar to what is experienced for Atlantics, would make a very significant difference to profitability if it could be routinely achieved.

Mortality

The EXAMPLE farm has the same pattern of mortality as the STANDARD farm. This pattern of losses is presented under column 8a on the production statements. Mortality is calculated monthly, based on a percentage of the number remaining.

The overall mortality for the EXAMPLE farm is 29% of the original number stocked. This is lower than the 31% for the STANDARD farm because faster growth allows the EXAMPLE farm to sell earlier and avoid some losses relative to the STANDARD farm.

Feed Conversion

The biological feed conversion rates (feed fed to round weight before mortalities) being realized in the industry are estimated to be slightly higher than previously described. The biological conversion rate is entered on a monthly basis in column 12A in the production statements.

For the EXAMPLE farm the rates have been increased slightly from the STANDARD farm to reflect a more rapid rise in the conversion rate with increasing size than previously estimated. The changes make larger fish slightly more expensive to feed.

The rise in conversion rate, after mortalities, (stock conversion rate) from the STANDARD farm to the EXAMPLE farm is only 2.10 to 2.11. This rise is less than might be expected because the EXAMPLE farm sells smaller fish, on average, than did the STANDARD farm (2.44kg relative to 2.81kg). The decision to sell smaller fish is based on cash flow needs which are discussed later in the report.

Feed Costs

The most substantial change in the cost of inputs over the last year has been a decrease in the cost of feed of approximately 5 to 15 percent. Feed is the largest single cost factor on a salmon farm, accounting for 42.8% of total costs of production for the example farm. Steam pelleted feeds now sell for approximately $0.92 to $1.05 per kilogram compared to $1.05 to $1.15 per kilogram last year. Intermediate energy level extruded feeds now sell for $1.05 to $1.20/kg compared to $1.25/kg a year ago. Top of the line extruded feeds now sell for $1.20 to $1.30/kg, compared to $1.35/kg a year ago.

These prices have come without a parallel decrease in nutritional quality because of increased competition and the ability to use cheaper ingredients as nutritional know how has increased. This trend should continue until the lowest cost recipe for acceptable nutrition is developed.

With fewer farms overall and generally larger farming companies making up the B.C. industry, feed manufacturers are competing harder for market share. As a result, feed prices vary considerably, depending on which discount programs a farm is able to qualify for and/or negotiate.

The dominant feed for chinooks has turned out to be the moderate priced, lower energy extruded feeds. These feeds list for approximately $1.20/kg and are available to most farms at approximately $1.15/kg, and to a few larger customers for as little as $1.05/kg.

The feed price for the EXAMPLE farm is set at $1.15 throughout the production cycle on the assumption that it is a successful, relatively influential farm.

Harvesting

The price declines of 1989 made essentially all size categories of fish unprofitable to produce. The fact that lower prices are paid for the smaller size categories meant that they resulted in even more of a loss than they had previously. There was, therefore, even greater incentive to raise fish in the large size ranges.

Despite the incentives to raise larger fish, most farmers had a "gun to their head" in terms of cash flow requirements and were required to sell fish before the optimum time, at relatively small sizes.

The EXAMPLE farm scenario has been programmed to begin harvesting at the relatively low average weight of 1.8 kilograms (4 lbs) to reflect the practice of starting harvests as early as possible and to compensate for the limitations in the program discussed below.

The limitations on the accuracy of the program's forecast of financial performance are discussed in detail in the original report (page 44). The most significant of these limitations stems from the use of a single average weight to represent all fish on the farm. In reality, a farm would have several different stocks or populations and each would have a normal or bimodal distribution of weights.

The use of average weights to forecast feed and equipment requirements provides reasonable precision. However, its use for forecasting revenues and processing costs is less accurate because sale prices are based on size categories and hence increase unevenly with increasing size. Processing costs are also based on size categories and hence decrease unevenly with increasing size. Therefore, the larger fish within a normally distributed population would be more profitable to harvest (i.e. sell for more and cost less to process) than the small. The use of size grading by a farm would minimize the harvest of small fish and hence increase the accuracy of these forecasts.

The use of a single average weight for an entire population means that all the fish in a given month's harvest are in one size category rather than distributed among several. If the analyst delays all harvests until after the critical two kilogram mark is reached, then the program's estimates of revenues and processing costs are based on the unlikely assumption that all the fish produced by the farm were of the same size category.

Number of Pieces Sold and Average Weight of Harvest

To allow the analyst to easily simulate different harvesting strategies, the average weight at which harvesting begins is determined by a hurdle. This hurdle is entered on line 2, on VARIABLES-1 page, under the heading "Average Weight At Which Harvesting Begins". The program will automatically begin harvesting once the hurdle, or target weight, has been met or exceeded, based on the average weight at the mid-month, as reported in column 18 on page CHIN2.

The hurdle for the EXAMPLE farm has been set at 1.8 kilograms. This forces the program to begin selling when the fish are below the 4 to 6 pound category. As a result, all of the first month's harvest (December) is presumed to be in the 2 to 4 pound size category and, therefore, to have relatively low revenues and high processing costs.

A harvest of relatively small fish in December is a realistic assumption. However, it is unrealistic to assume that all the fish would be small. The program therefore has a low estimate of revenues and high estimate of processing costs from this harvest. This offsets the opposite type of errors that occur with all subsequent harvests when average weights are above the 4 pound range, and the program assumes that there are no small fish.

After deciding what weight to begin harvesting (hurdle weight determined), it is necessary to decide how rapidly to harvest. In the program, the timing of harvests is determined by the "Percentage Sold Each Month" factor on line 3 of VARIABLES-1 page. This is the fraction of the number of fish remaining, when harvesting begins, that are sold each month until no more remain.

For the EXAMPLE farm, the percentage sold each month has been set at 17 percent. This results in the harvest occurring over a six month period, from December, when the hurdle weight is first exceeded, until May.

During this time, the number of pieces sold remains the same until the last month, when the balance, after mortalities during the harvesting period, are sold. Even though the number of pieces sold remains the same for five months, the harvested weight increases because the average weight of each piece increases. Such an increase in production volume is a realistic assumption considering the intention of any farmer is to produce as many large fish as possible. Ending the harvest in May is also realistic considering the price softening that occurs in summer due to increased competition from the commercial salmon fishery.

Overall, the EXAMPLE farm has an average round harvest weight of 2.44 kilograms, or 5.4 pounds, which is in keeping with industry expectations. It should be understood however, that to achieve this average it would have been necessary for the farmer to size grade and then sell the larger segment of his or her stocks. It would also be necessary to sell the fastest growing stocks earliest.

Processing Costs

The charges for processing and packaging have changed in magnitude and structure since the program was written in early 1989. At that time there were distinct charges for each weight class of fish produced (such as 2 to 4 pounds, 4 to 6 pounds, etc.) based on the final weight breakdown of a delivered load of fish, after processing was complete. The tendency now is to charge a flat rate based on what the average weight is for the load delivered.

Processing costs remain highest for the smaller size ranges, but the use of averages diminishes the effect of these differences.

The program allows for three weight ranges to be assigned unique processing charges. These appear under line 11, on VARIABLES-1 page, under the heading 'Processing Weight Losses and Costs Per Kilogram of Finished Product'. The weight categories are 0-1 kg, 1-2.5 kg, and 2.5 kg and over.

The processing costs for the smallest size range are still significantly higher than the other two, while the two larger ranges are similar in costs. This difference is reflected in a higher charge for bleeding and gutting of $0.95/kg for the small size range, relative to $0.85/kg for the intermediate and large size ranges.

In general, processing costs are quite variable within the industry. This is due to the interplay of four variables. These are: the volume processed by a company at any given time and over an entire year (economies in purchasing services); differences in packaging materials used; differences in average fish weight; and method of transport.

There can be a discount of 5 to 10 percent on the cost of gutting (which includes the labour involved in packaging) for customers who provide processing plants with in excess of a million pounds of product per year.

Packaging costs (materials only) can vary from $0.05/kg ($.02/lb) for large disposable cardboard totes (i.e. bulk totes), to $0.38/kg ($0.17/lb) for specialized airline packaging with double liners.

Although cost reductions have not been built into the model, farms that routinely produce 5 kg, or 12 lb, average weight fish can have the labour component of their processing (gutting) reduced by 3 to 6 percent, even though large volumes may not be handled.

Transport costs for live haul to plants can range from $0.33 to $0.44 per kilogram ($0.15 to $0.20/lb) depending on the size of the load being carried (i.e. whether the vessel is at capacity or not) and distance to the processing plant (which tends to play a less important role for most farms in the Campbell River region).

Transport of dead fish to processing plants is usually cheaper than transport of live fish, but it is difficult to compare the two methods directly because transport of dead fish includes stunning and bleeding at the farm, thereby reducing the labour costs at the plant.

For the EXAMPLE farm it has been assumed that the fish are stunned and bled at the farm and transported dead to processing. To simulate this scenario, the factor for 'Transport Cost: Of Live Fish to Proc.', under line 13 on VARIABLES-2 page, must first be set at zero. The cost of transport must then be included under the "bleed" costs heading in the table of 'Processing Wt. Losses and Costs', under line 11.

An overall cost for transport to processing, bleeding, processing and packaging of $0.52/lb, or $1.15/kg, has been chosen as a reasonable expectation for a moderate sized company raising chinooks to the weights described, and in the quantities assumed in the model. A budget level of $0.30/kg for packaging ($0.14/lb) is for good quality packaging and is appropriate considering the sale price expectations that are described below.

Overall, economies of scale, packaging, average fish weight and transport can affect the cost of processing by as much as $0.30/lb or $0.65/kg. This can mean the difference between profit and loss at current price levels.

Processing Losses

Farmed chinook are normally sold gutted, head on and gill out. The STANDARD farm model had assumed that the gills were left in. This resulted in a weight reduction when going from round weight to dressed weight of 11 percent. For the EXAMPLE farm the weight reduction has been increased to 14 percent to allow for removal of gills.

It is interesting to note that the weight losses will vary (for gill out chinook) from as little as 12% to 17%, depending on how well starved a fish is, its general health and whether or not it is jacking. Maturing fish have a higher weight loss with processing because of gonadal development. This additional weight loss is another hidden cost of jacking.

A processing loss level of 14% is a reasonable expectation for a chinook farm that avoids excessive maturation and starves its fish for seven to ten days before processing.

The gills are typically not removed from Atlantic salmon because these have traditionally been used as an indicator of freshness. The additional three percent weight loss associated with gill removal in chinooks represents a significant loss of profit to chinook farmers. This is because the marketable weight is reduced by 3% and processing costs are typically higher because of the additional labour involved. The removal of gills has about a 5% affect on the "bottom line". Both gilling and bleeding are procedures which improve shelf life and product quality and are widely perceived as important steps in the processing process, but it is debatable whether they are really in the farmers best interest.

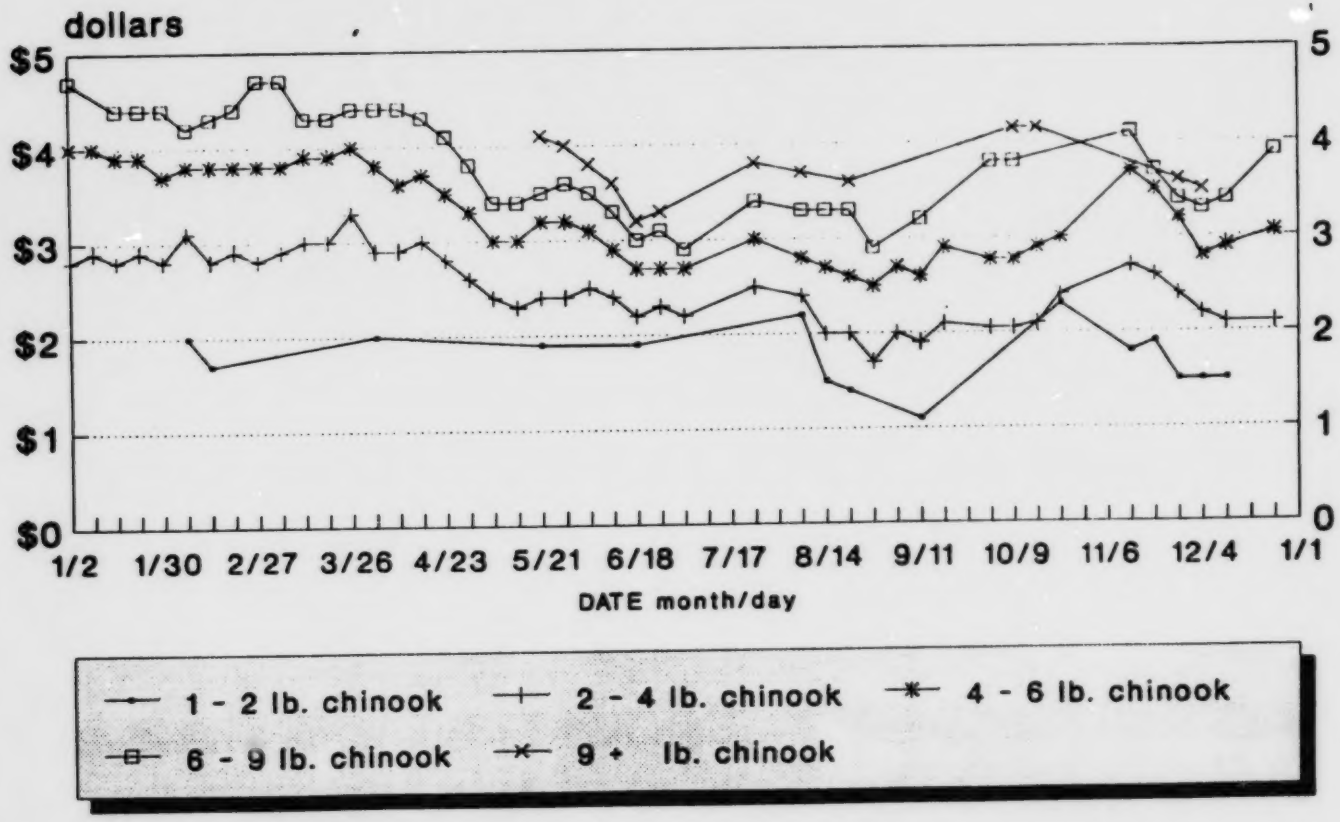
Sales Prices

The program is designed to allow prices to be set for each of five weight classes. These prices are F.O.B. Vancouver, gutted, gill out, and packaged, and before commissions to brokers. This table appears on the VARIABLES-1 page, under line 12; 'Sale Prices for Top Grade (F.O.B. Van, cleaned and pack.)'

The pattern of F. O. B. Vancouver sales price fluctuations for these same five weight categories has been plotted for 1989 and 1990 up to August on figures 1 and 2 overleaf. The data are from B.C. Salmon Farmers Association reports of industry averages.

FIGURE 1 - 1989 Farmed Salmon Prices

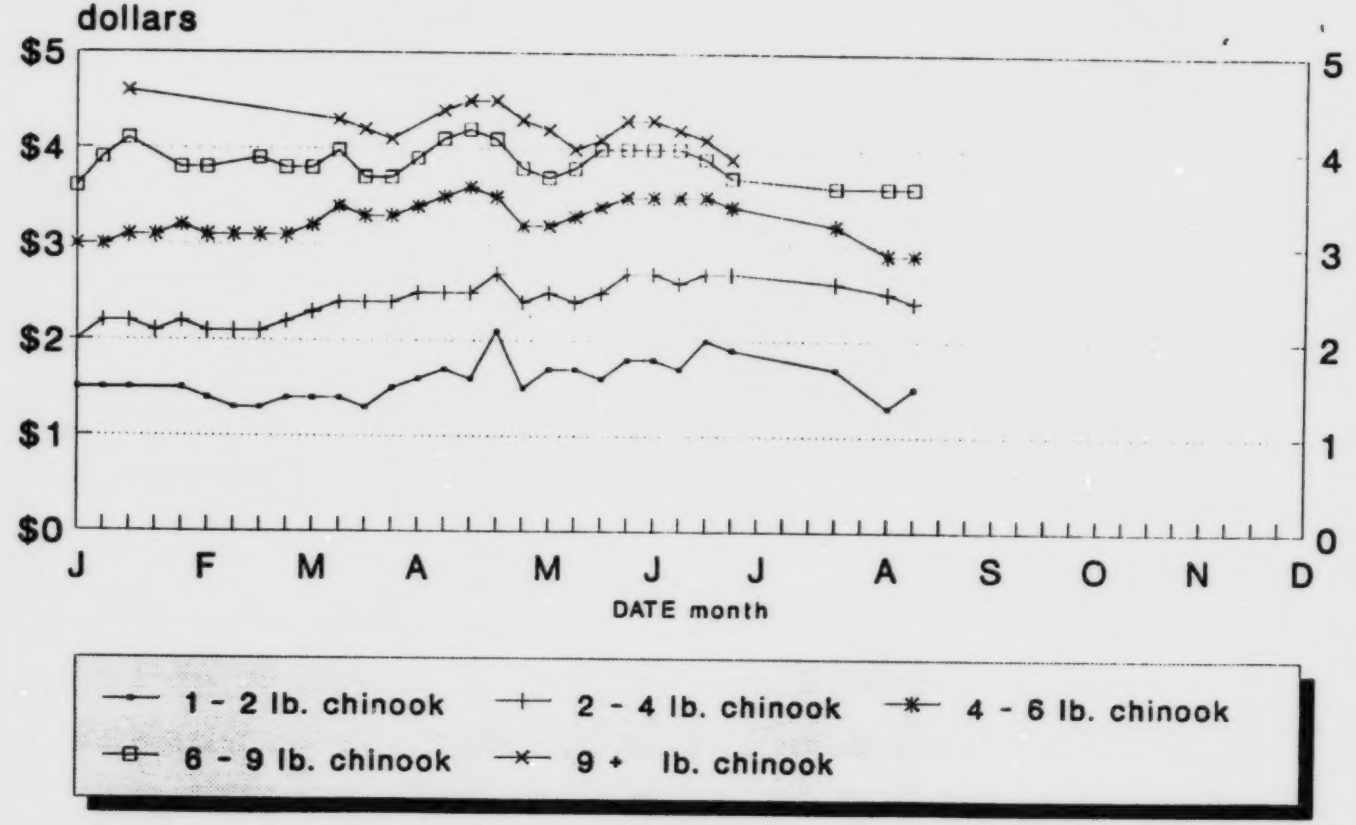
Head-On Dressed & Boxed, FOB Vancouver



$Cdn. Before Mark-up.
Source - B.C. Salmon Farmers Association

FIGURE 2 - 1990 Farmed Salmon Prices

Head-On Dressed & Boxed, FOB Vancouver



$Cdn. Before Mark-up.
Commisions included after APR/90.

The budget levels for sale prices have been set at levels prevailing in the spring of 1990. A price of $7.70/kilo (or $3.50/lb) is a reasonable, but possibly a little optimistic, expectation for average sale prices during the time of year that the EXAMPLE farm has its harvests. This assumes sale of the bulk of the product into top market niches in high quality packaging.

Following the lows of 1989 and early 1990, prices for fresh farm salmon have risen and stabilized. This is due to a variety of factors, probably including decreases in world production capacity as a result of bankruptcies and poor financial performance, self imposed price and production restrictions by Norway, increased consumption as a response to lower prices, continuing total market growth during a period of slower production growth and fewer fire sales and less poor quality cheap farmed salmon as production technologies improve.

Optimistic individuals see prices rising into 1991. No one seems to expect historical price levels to be reached again as production technology appears able to keep pace with market development.

The primary market for Canadian farmed fish is the U.S. so exchange rates have a significant effect on the prices that farmers are paid. Over the past two years there has been a significant increase in the value of the Canadian dollar relative to the U.S. dollar. As a result, farmers are receiving relatively less for their fish. Some farmers have described exchange rate fluctuations as a serious problem.

Sales During the Commercial Fishing Season

The program allows sale prices to be altered during the third quarter to compensate for the effects of the commercial fishing harvest. This compensation is not relevant to the EXAMPLE farm because there are no summer sales. However, the factor at the bottom of the table of prices, on VARIABLES-1 page has to be set at 85% (0.85) to indicate the kind of price drop that a chinook farmer can expect for summer sales.

Pen and Net Requirements and Costs

The program automatically purchases pens and nets based on a number of factors that are set on the VARIABLES-2 page. The factors include the purchase price of: walkways per metre, netting per square metre, and construction labour. A full explanation of these factors appears in the original report.

To reflect the economics of a leaner farm than the STANDARD farm originally modelled, the cost of pens and nets has been reduced to 3/4 of previous levels. This reduction reflects

the fact that there is now used equipment available and that equipment suppliers are more price competitive.

There have been no technical changes to the equipment in use on the EXAMPLE farm. Pens of 15 x 15 metres are still common and an average net depth of 12 metres is reasonable.

A significant but subtle change that has been made in going from the STANDARD farm to the EXAMPLE farm is an increase in the theoretical peak loading density of fish biomass in nets (under line 14; 'Pen and Net Requirements and Cost: Max. Loading Density'). The increase is from a peak of 8 kg/cubic metre to 10 kg/cubic metre.

This increase has been made to reflect what appears to be a reasonable industry expectation for a farm with 15 x 15 metre pens. It is not to suggest that there is a tendency towards higher loading densities; in fact, probably the reverse is true. There are farms that use large pens (100 x 100 feet) that claim to use loading densities as low as 3 kg/cubic meter at the peak.

Loans

The most highly levered farms of two years ago were the ones hardest hit by sale price declines. The remaining farms in the industry tend to have relatively modest debt levels. The EXAMPLE farm has been given a 35% of peak cash requirement debt level, including all trade credit that results in interest charges.

The nature of the debts for the EXAMPLE farm model are in the form of five and ten year loans. The loans are calculated assuming that principal and interest payments are made at the end of each quarter starting in the quarter in which the loans were taken.

Five year loans are presumed to represent the kind of debt that would be associated with the leasing of capital assets. The quantity and timing of five year loans was determined after all capital purchases had been calculated. Loans equalling half of the value of capital purchases in a given quarter were then introduced into the five year loans table, under line 16, 'Loan Timing and Interest Charges' on VARIABLES-1 page. On the same table an interest rate of 18% (0.18) was introduced to reflect the current cost of borrowing.

Ten year loans are meant to represent long term debt and/or operating lines of credit from banks or feed companies. Ten year loans were used to finance the farm during the period of its peak requirement in the third and fourth quarters of the second year of operation. Two loans of $200,000 each were introduced into the ten year loans table, on the VARIABLES-2 page.

The timing of the ten year loans, in the third and fourth quarters of the second year of operations, is a natural time for borrowing to take place. Not only are the farm's needs the greatest but its ability to borrow is at its highest because of peak inventory values and the beginning of cash flows.

An interest rate of 18% has been assumed for ten year loans. This is reasonable considering the prime rate is now hovering around 14% while some farms are apparently paying 21%.

Overall, the debt level on the farm is relatively low (36% of peak cash requirement) because loans are only taken during the first two years of the forecast period. In all subsequent years the loans are being repaid so the level of leverage is decreasing.

Smolts

As has been described, the EXAMPLE farm uses only good quality monosex chinook smolts that arrive in late April at 7 grams. A price of $0.70 each, delivered, remains a reasonable expectation and therefore has not been changed from the STANDARD model.

Smolt costs are changed by the factor under line 17 on VARIABLES-2 page, 'Factors For Cost of Goods Sold: Smolts: Chinook'.

Medicine and Veterinary Services

To reflect subtle improvements in husbandry and more cost conscious management, the factor for medicine and veterinary charges, under line 17 on VARIABLES-1 page, has been reduced from $10/tonne of biomass managed each month to $8/tonne.

Feed Transport

The transport of feed to farms has been estimated to cost $.07/kg. Charges in the Campbell River region vary from 5 to 10 cents/kg, depending on method of transport, volumes shipped, and the remoteness of the farm.

The factor for feed transport costs appears at the top of VARIABLES-2 page, under line 13, 'Transport Costs: of Feed to Farm'.

Wages

The STANDARD farm model paid generous wages relative to what appears to be the norm now. The factors for wages, under line 17 on VARIABLES-3 page, have been set at $1,500/month for additional wages paid to the foreman and on-site management plus $1,800/man required/month. These levels are meant to represent the averages for the farm and to include all benefits and direct costs, such as room and board, associated with staffing the farm.

The number of staff required is automatically calculated by the "tonnes/man/day" factor. A setting of 0.6 means that each employee will feed 0.6 tonnes of food per day so the farm requires approximately 3.3 full time staff to do all the necessary feeding.

Fuels

A factor of $5/tonne of biomass managed generates a reasonable expense for a farm that is assumed to be 10 kilometres from a road and that operates generators for electricity.

Fish Transports

The cost scenario for the EXAMPLE farm being modelled assumes that harvested fish are stunned, bled and transported dead to a processing plant in the Campbell River area. The "bleed" cost on the table of processing losses and costs therefore includes the cost of transport of fish to processing. The factor for the transport cost 'Of Live Fish To Proc:' is therefore set at zero. (It is actually set at 1/10 of $0.01 to avoid error messages.)

The cost of truck transport of packaged fish to Vancouver, from Campbell River, is currently estimated at $.04/lb, or $0.09/kg. The charges can range from $0.05/lb for truck loads of less than 15,000 pounds to as little as $0.025/lb for fully loaded trucks with fish in bulk totes.

Management Salaries

In keeping with the theme of a leaner operating style and the actual reductions in many head offices recently, the management salaries have been reduced to a minimum level of $4,000/month from the $6,000/month figure that was used in the STANDARD farm model. This charge is meant to include the cost of all head office labour functions.

A charge of $1,000 per 50,000 smolts would apply when that figure exceeds the minimum level described above.

Stock Insurance

Since the original report was prepared there have been a number of serious algae blooms and associated fish kills. In the authors' opinion, bloom losses are what pushed several farms in the Sechelt area over the financial brink. Even well managed farms cannot survive repeated bloom losses. Insurance helps but the 20 to 30 percent deductible on insurance claims eliminates any chance of profitability, particularly during periods of low prices. If a farm manages to survive one bloom, then premiums increase and deductibles become even higher. With subsequent bloom losses there is little hope of financial survival.

An insurance rate of 4.5%/year (under line 18 on VARIABLES-3 page) of the insured market value of peak inventory, remains a reasonable cost expectation for a farm without a history of algae bloom losses, that is well managed and appears to be well designed, properly anchored and sturdy. For example, steel pens would generally be better regarded by insurance companies than wooden ones because the former are usually constructed by companies with engineering services and track records, while the former are often "home made" or built by small companies that diversify into fishpens to take advantage of a short term local opportunity.

Office and Telephone

To reflect a leaner management style, and more experience in the industry, office and telephone expenses have been reduced from $10/tonne of biomass managed (the figure used in the STANDARD farm) to $9/tonne for the EXAMPLE farm. The annual charge peaks at $13,000/year at this rate, relative to $27,000/year for the STANDARD farm.

Legal and Accounting

The factors for legal and accounting charges have been left as they were for the STANDARD farm (under line 18 on VARIABLES-3 page). There is presumed to be a one time start-up expense of $30,000 as well as an ongoing charge of $2/tonne of biomass managed. Because the EXAMPLE farm is smaller than the STANDARD farm, these floating factors result in a peak annual expense of $4,000 for the EXAMPLE farm compared to $5,000 for the STANDARD farm.

Maintenance

The floating charge for maintenance has been left at 5 percent of one year old assets. Since the EXAMPLE farm is leaner and smaller than the STANDARD farm, the maintenance expense peaks at $29,000 per year compared to $54,000 per year for the STANDARD farm.

Feed Storage

For the more frugal EXAMPLE farm, the capital costs of feed storage have been reduced from $2,000/tonne for the STANDARD farm to $1,000/tonne. This factor is multiplied by the peak two week feed requirement for the EXAMPLE farm, to estimate the cost of a facility capable of storing a two week feed supply. The resulting outlay is $54,000. This is presumed to be a one time purchase that takes place in the third quarter of the first year of operation.

Accommodations

Many of the remote farms in B.C. have been hit hard by recent price declines. The remaining farms on average are more accessible to labour pools.

For the EXAMPLE farm a factor of $15,000 per full time employee (under line 19 on VARIABLES-3 page) has been used to estimate the cost of accommodations, laboratory and office facilities on the farm. Since the previous factors for determining the wage costs resulted in approximately 3.3 staff being employed, the total accommodation expense becomes $50,000. This is presumed to be a one time purchase that occurs in the second quarter of the first year of operations.

Docks and Decks

Under the heading 'Docks and Decks' is included the purchase of extra walkways, temporary sheds, net cleaning floats and related working and storage space. Within the program, these purchases are related to the biomass being managed and to the feed volume being handled.

Under line 19 on VARIABLES-3 page, the factor for 'Decks and Docks' is set at 30% of the total cost of feed storage facilities. This amounts to a one time purchase of $16,000 in the third quarter of the first year of operations.

Power Supply and Feeders

The EXAMPLE farm is presumed to require a single large generator to provide power to the accommodations. A one time charge of $15,000 reflects the cost of a power source that does not need to be fail-safe, because there are no automatic feeders.

Miscellaneous and Farm Equipment

This category of capital expenses includes start-up costs such as site acquisition and initial bio-technical surveys as well as SCUBA gear, pumps, net rollers, pressure washers and feed buckets etcetera.

The STANDARD farm had a start-up expense of $100,000. This charge has been reduced to $40,000 for the EXAMPLE farm, under line 19 on VARIABLES-3 page.

The factor for the purchase of miscellaneous equipment has been set at 10% of all previous capital purchases for a given quarter. This setting results in total miscellaneous purchases of $78,000 in the first two years of operation.

RESULTS

Figure 3, overleaf, is the summary table for the EXAMPLE farm. A complete printout of the EXAMPLE farm model is provided as Appendix A.

The EXAMPLE farm has a Cost of Production (C.O.P.), of $6.57/kg, dressed and boxed, F. O. B. Vancouver. This represents the costs for a well run, lean operation in the Campbell River region that has reasonably good "luck" in terms of survivals and growth.

The average weight of the fish harvested was 2.1 kilograms dressed weight (4.62 pounds), which is a reasonable expectation. Considering that prices for 4 to 6 pound salmon dropped as low as $2.50/lb, or $5.50/kg, in 1989, even this lean well run farm would have been losing money throughout much of 1989.

The EXAMPLE farm has a peak capital requirement of $1.54 million, of which $0.98 million is presumed to be equity. The return on investment, based on the internal rate of return (IRR) of 10 years of cash flows is a low 10.47 percent. This is an ominous result considering that the sale prices assumed in the model were relatively generous. The break even fish prices (where ten year IRR equals zero) are estimated to be only 7% below those prices used in the model, or an average of $6.95/kg or $3.16/lb.

It is the author's opinion that the EXAMPLE farm is closer to the industry norm than was the STANDARD farm. Since both are "well run" farms, this is a reflection of the fact that the industry as a whole is technically more advanced than a year ago. The variation in costs of production have also decreased with the dissemination of state of the art information.

FIGURE 3: EXAMPLE CHINOOK SUMMARY STATISTICS

DESCRIPTION OF FARM BEING MODELLED: 36% debt
150,000 chinook smolt farm in Campbell River area
Uses metal pens, no feeders, accommodations and feed storage on barge
Fish are stun and bled on site

PRODUCTION	No. smolts started	TOTAL HARVEST Round weight	TOTAL HARVEST Dressed weight	AVERAGE WEIGHT Round weight	AVERAGE WEIGHT Dressed weight	PRODUC./SMOLT Round weight	PRODUC./SMOLT Dressed weight	MORT.	FEED CONVERSION (Feed/flesh) Round	FEED CONVERSION (Feed/flesh) Dressed	AVE. SALE PRICE F.O.B. Van.	AVE. SALE PRICE Farm gate	REVENUES
CHINOOK	150000	259637	223288	2.44	2.10	1.73	1.49	29%	2.11	2.45	$7.46	$5.45	$1,664,651
COHO	0	0	0	0	0	0	0	0	0	0	0	0	0
COMBINED	150000	259637	223288	2.44	2.10	1.73	1.49	29%	2.11	2.45	$7.46	$5.45	$1,664,651

FINANCIAL	Total cost of produc.	COST OF GOODS SOLD/kg of produc. Feed	Process.	Trans.	Total	OVERHEAD/kg of production Fixed	Interest	Dep.	Total	R.O.I. (10 year)	PEAK REQUIREMENT (in millions $) Debt	Equity
$/KG	$6.57	$2.82	$1.15	$0.26	$5.13	$0.78	$0.35	$0.32	$1.45	IRR 10.47%	0.56	0.98
%/KG		42.8%	17.5%	4.0%	78.0%	11.8%	5.3%	4.9%	22.0%	NPV@10% 19506		

PART II: ATLANTIC SALMON FINANCIAL ANALYSIS

One of the primary objectives of this report was to explain why there is growing interest in the farming of Atlantic salmon in British Columbia. In the text that follows, the unique aspects of Atlantic salmon biology and culture will be discussed as the EXAMPLE CHINOOK farm program is modified to be an EXAMPLE ATLANTIC farm.

Terminology

The seawater life of farmed Atlantic and chinook salmon are very similar. Both are stocked to the sea in spring and have a 24 to 28 month production window before maturation requires farmers to harvest.

Atlantic and chinook stocks both have the disadvantage that a proportion of the population reaches sexual maturity early and at a small size. For chinooks, this occurs after only 16 months in the sea and for Atlantics after only 14 months in the sea. In chinook stocks these early maturing fish are called "jacks". In Atlantics, early maturing fish are referred to as "grilse".

Throughout the remainder of this report, the early and late maturing segments of Atlantic salmon populations will be referred to as grilse and salmon respectively. The use of the term "salmon" to refer to the segment of the population having two or more sea wintering years may seem confusing, but is in keeping with industry practice.

Life History

Figure 4 depicts the saltwater growth curve of a typical monosex S0 chinook population. Figure 5 depicts the saltwater growth curve of a typical S1 Atlantic salmon strain that is currently being farmed in B.C.. Although the life histories are similar, feminization has essentially eliminated the jacking problem in the chinooks, while grilse remain in the Atlantics.

The significantly larger smolt of Atlantics, relative to chinooks, provides a size advantage which persists throughout the saltwater grow-out phase. This results in a much wider marketing window for Atlantics. The critical two kilogram mark is reached by June, after 14 months for the grilse, and July, after 15 months for the salmon. The chinooks do not reach the same average weight until about December, six months later.

Because of their greater starting size, grilse can be sold before maturation, in September and October, at a greater weight relative to chinook jacks. Because grilse sell in larger

FIGURE 4 - MONOSEX CHINOOK GROWTH DATA

August 1990

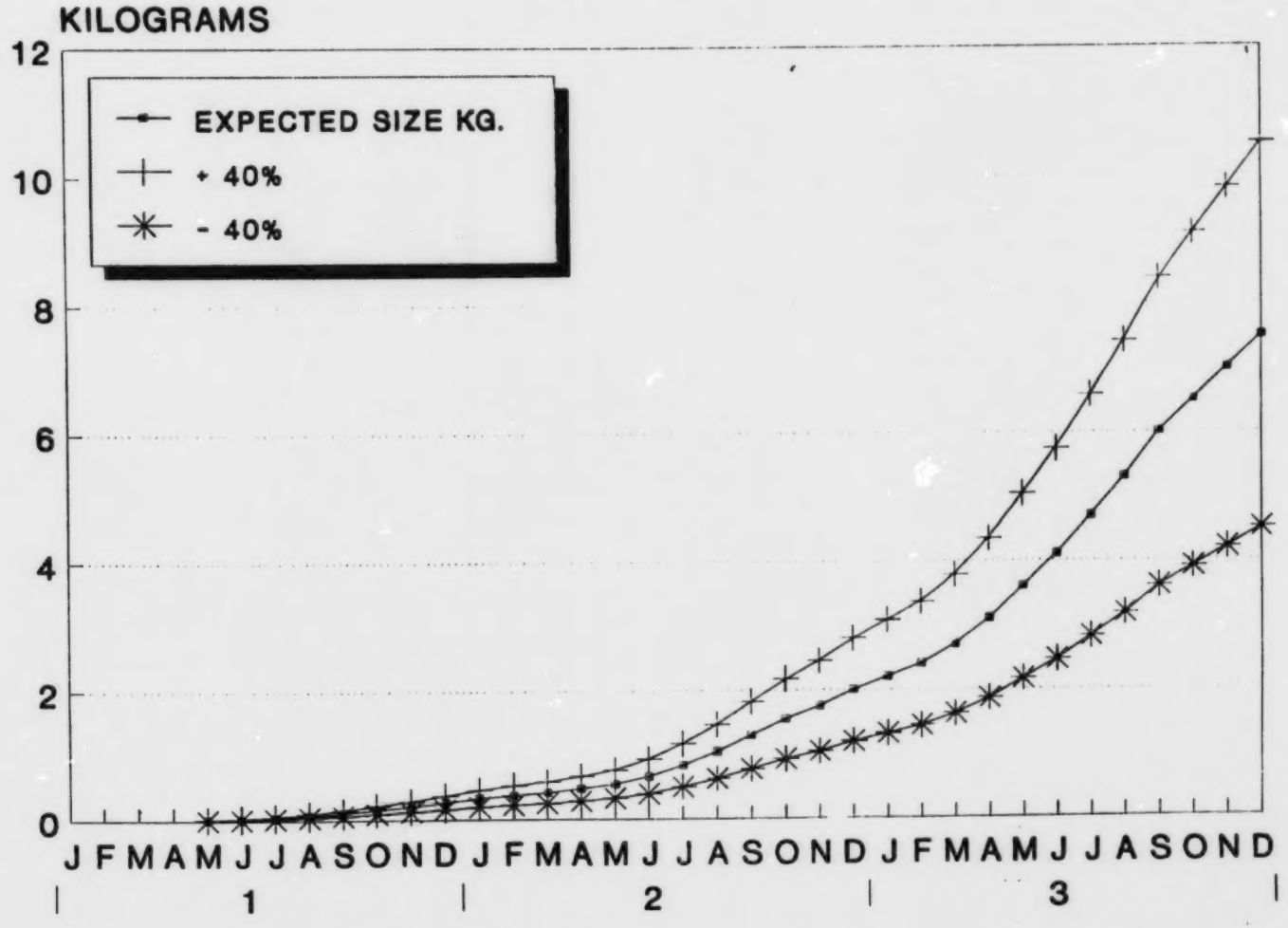
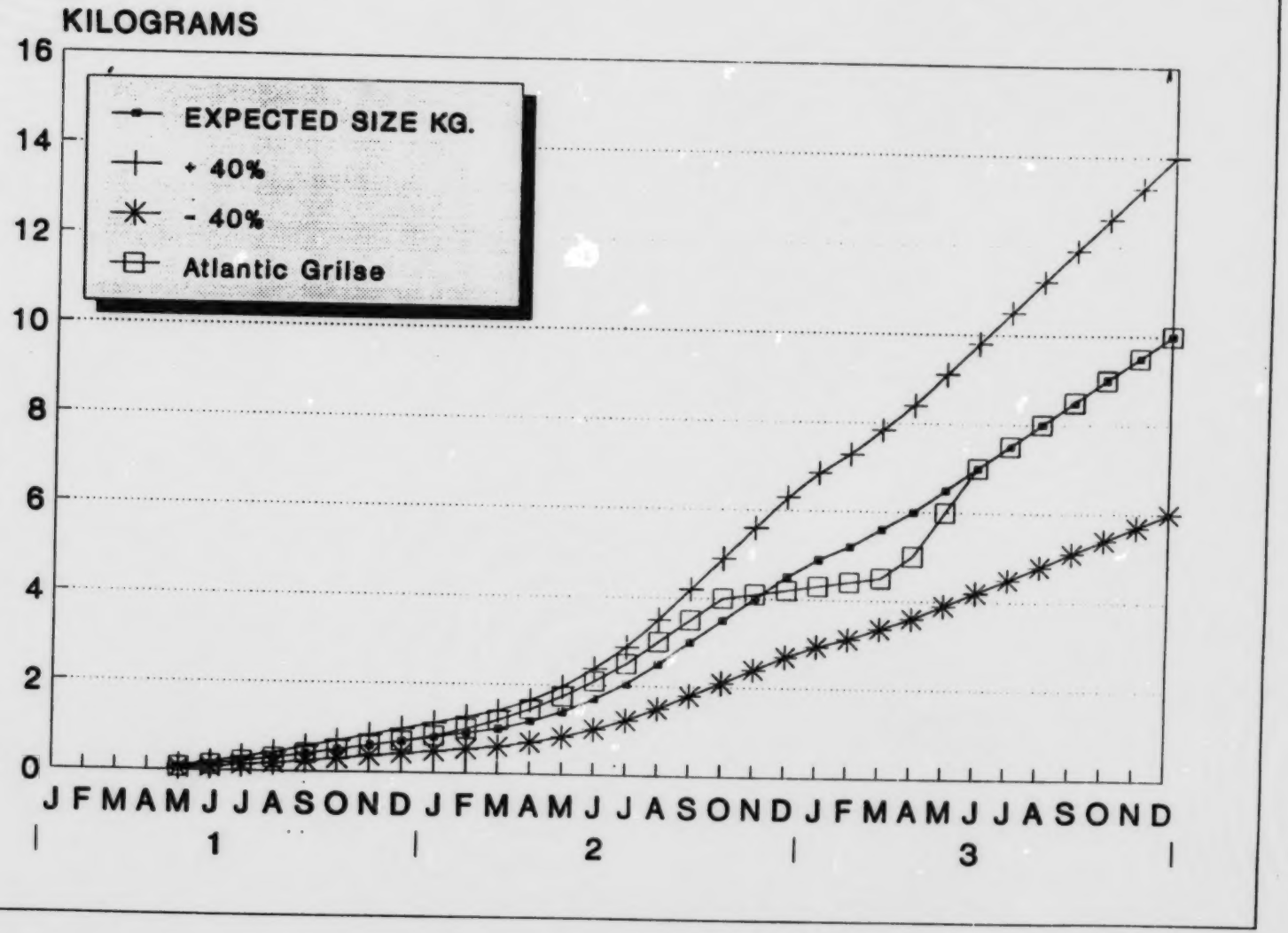
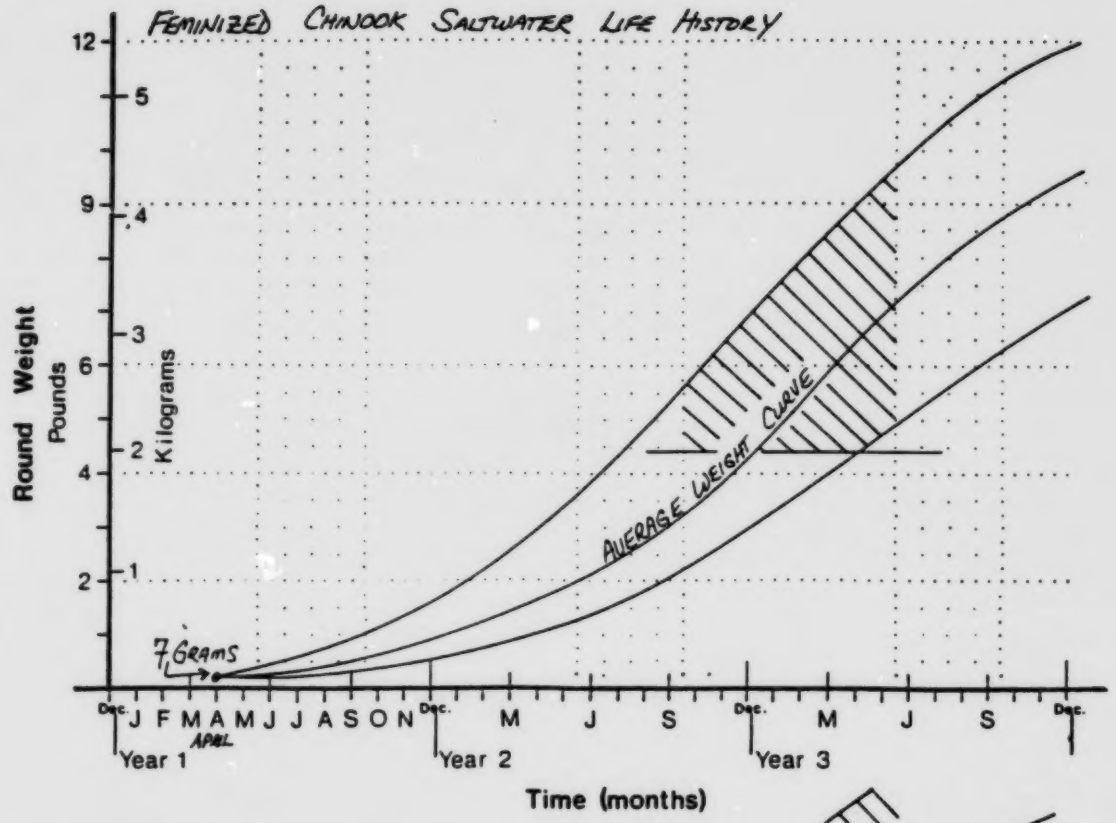
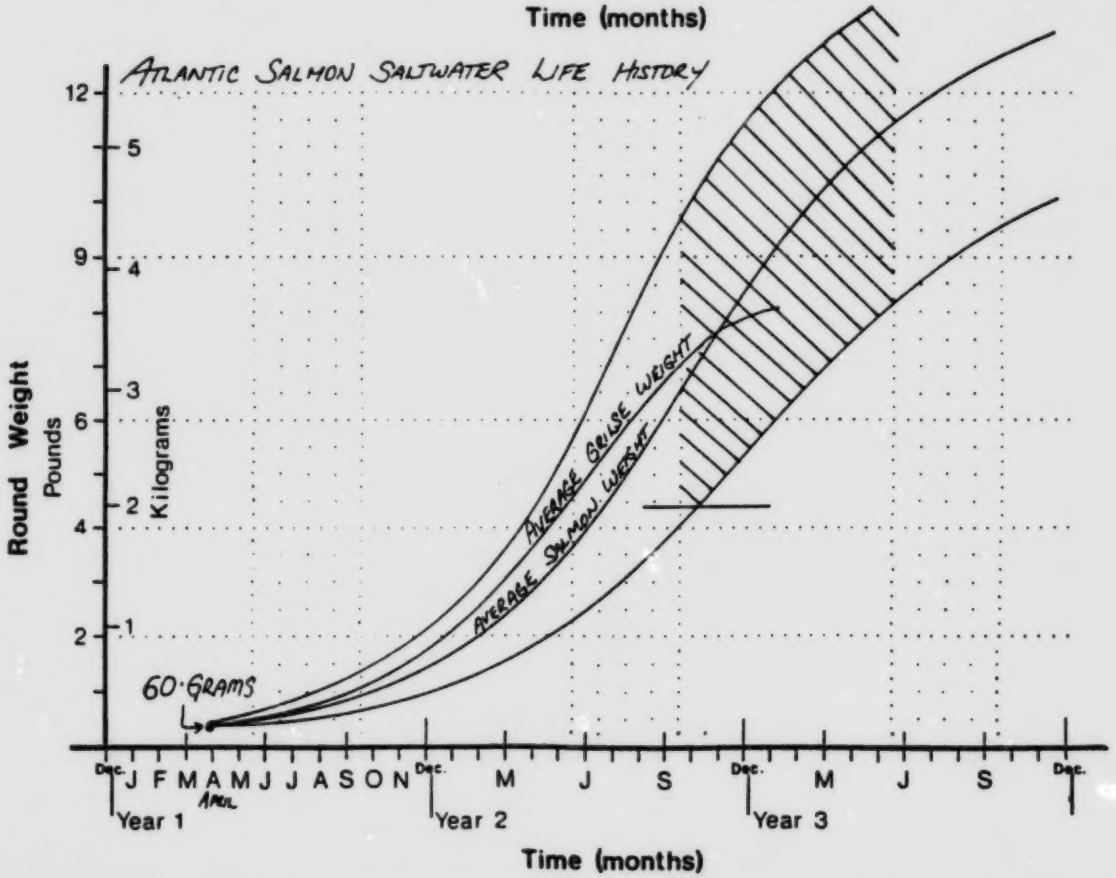


FIGURE 5 - ATLANTIC SALMON GROWTH DATA

August 1990




FEMINIZED CHINOOK SALTWATER LIFE HISTORY
Round Weight
Pounds
Kilograms
12
9
6
4
2
5
4
3
2
1
7 GRAMS
AVERAGE WEIGHT CURVE
Dec. J F M A M J J A S O N Dec. M J S Dec. M J S Dec.
APRIL
Year 1
Year 2
Year 3
Time (months)


ATLANTIC SALMON SALTWATER LIFE HISTORY
Round Weight
Pounds
Kilograms
12
9
6
4
2
5
4
3
2
1
60 GRAMS
AVERAGE GRILSE WEIGHT
AVERAGE SALMON WEIGHT
Dec. J F M A M J J A S O N Dec. M J S Dec. M J S Dec.
APRIL
Year 1
Year 2
Year 3
Time (months)

size categories and have a longer marketing window, they are less financially damaging than jacks.

The size advantage in the salmon portion of the population allows for year round production of large sizes. Chinooks do not reach marketable size during their second fall in the sea (after 16-19 months of seawater growth), so there is a significant gap between the harvesting of the jacks and the regular harvest.

Reaching two kilograms in July implies that Atlantics can be sold at well over 2 kg during the winter months when prices are highest. The average Atlantic salmon harvest weight in B.C. is therefore 7 to 10 pounds, compared to 3 to 5 for chinook.

Grilse

Grilsing is probably the biggest problem associated with Atlantic salmon farming. Grilsing rates for a given stock are dependent on such things as feeding patterns and diet. Therefore, the grilsing rate for a given stock may vary from year to year and between farms as management patterns change.

Genetics, however, is considered to be the most critical factor controlling grilsing rates. Internationally, there are stocks with rates as low as 5% and some as high as 100 percent.

The Atlantic salmon stocks now in B.C., with grilsing rates of 30% common, and levels as high as 60% rumoured, are considered to be relatively bad.

Fortunately, Atlantic salmon suffer handling better than chinooks so grilse can be visually sorted, before losing value, with only minimal mortality. While the handling associated with sorting is not desirable during the peak summer water temperatures, losses in the remaining population would normally be under one percent.

Generally speaking, grilsing is a more manageable problem than jacking. Sorting of jacks from chinook populations can be considerably more damaging to the remaining population due to scale loss. In addition, by the time jacks can be sorted by colour, they may have already lost value. In addition to undesirable coloration , the harvested jacks may have thin belly walls, well developed gonads, and many would be disfigured. If they are sorted by size before disfigurement, then the fastest growing non-jacks are also harvested.

Grilsing is a significant problem but if kept to a relatively moderate level it is manageable. It becomes more of a problem when and if summer prices drop to abnormally low levels because the harvest cannot be delayed. In general, grilsing is a forced harvest that farmers can work around but would be better off without.

Grilse are both males and females and therefore feminization technology will not eliminate it. Research is currently underway internationally on triploidy (a treatment to induce three instead of two sets of chromosomes) as a means of sterilization. Genetic selection over the past 20 years has apparently provided the Norwegians with considerably decreased grilsing rates.

Smolts

Most Atlantic salmon smolts are naturally S2's in that they spend two years in fresh water. For the purposes of farming, the freshwater life cycle has been accelerated. Over 90% of farmed Atlantic smolts are S1's, with the balance being S2's only because they had not smolted in time for stocking to the sea as S1's. S1 smolts spend 16-18 months in fresh water and are stocked to the sea in the early spring, just like chinook smolts.

Atlantic smolts have a longer fresh water stage so they are bigger when they enter the sea. S1 Atlantic smolts range from 30 to 60 grams, rather than 5 to 8 grams for chinook smolts. This size advantage gives Atlantics a substantial headstart in the race to reach marketable size.

It is agreed that a 45 gram chinook smolt would perform as well, in terms of growth, as a 45 gram S1 Atlantic smolt. For this reason, some B.C. farmers are experimenting with S1 chinook smolts. Early results are promising, but the information is sketchy.

PROGRAM MODIFICATIONS

The headings on columns of data in tables and on charts have been changed from those used in the EXAMPLE CHINOOK farm for the EXAMPLE ATLANTIC farm program. The basic model is essentially the same except for the differences described below and for page labels and corresponding range names used for printing.

The following discussion reviews only the biological and production cost differences between chinook and Atlantics, which necessitate modifications to the model when going from the EXAMPLE CHINOOK farm to the EXAMPLE ATLANTIC farm.

One conceptual change has been made to accommodate these modifications. The chinook program had production statements for two species, coho and chinook, with coho production set at zero. The Atlantic salmon model assumes that only one species is stocked but has separate production statements for the salmon portion of the population and the grilse portion. The salmon portion replaces the chinook, while the grilse replaces the coho. In this way, the very different growth and performances of the two substocks can be treated differently and more precise predictions can be made.

The number of smolts stocked to the farm is automatically divided between the 'salmon' and the 'grilse' life histories according to a factor set by the analyst under line 1, VARIABLES-1 page.

Number of Smolts/Farm Size

Atlantic salmon farms require fewer smolts than chinook farms to produce an equivalent tonnage. This is because the average harvest weight is higher. The EXAMPLE ATLANTIC farm stocks 75,000 smolts each spring. This is half the number of chinook smolts stocked by the EXAMPLE CHINOOK farm. The ultimate production turns out to be 260 tonnes dressed weight for chinook and 224 tonnes for the Atlantics.

When deciding on farm size, the number of smolts started each year is introduced at the top of VARIABLES-1 page. For the EXAMPLE ATLANTIC farm, the EXAMPLE CHINOOK farm program has been modified to allow one number of smolts (cell D12) to be used to introduce numbers into both the salmon and grilse segments of the population. The percentage of salmon versus grilse is set by the factor in cell E11 which sets the percentage of the smolts that are salmon. The remainder are assumed to be grilse.

For the EXAMPLE ATLANTIC farm it is assumed that there is a 25% grilsing rate. This is a reasonable expectation for stocks in use in B.C. Therefore, of the 75,000 smolts, 56,250 (75%) are treated as being 'salmon' and 18,750 (25%) as being grilse.

Timing and Size of Smolts

The saltwater entry date for good quality Atlantic smolts is the same as that for chinooks. In general, farmers try to get big smolts early. For the EXAMPLE ATLANTIC farm the stocking date is assumed to be the end of April, the same as for the EXAMPLE CHINOOK farm.

The average stocking weight of the smolts is presumed to be a respectable 45 grams. This weight has been introduced as the first number in column Y on pages ATLANTIC (cell Y12) and GRILSE (cell Y61).

Growth Curve

The growth curve depicted in figure 5 appears in numerical form under column 5A on page ATLANTIC 1.

The growth curve for the grilse is slightly steeper, initially, than the one for salmon as a result of faster growth. For practical purposes, this growth curve could end after 16 months due to maturation. However, Atlantic salmon can be allowed to recondition to become silver brights again. This period of reconditioning appears as a flat section on the grilse curve in figure 5. In reality, this is rarely done in B.C. because of anticipated high mortalities during reconditioning.

The growth of grilse is not as significantly different from the bulk of the population as jacks are different from the bulk of a chinook population. In general, harvested grilse are estimated to be approximately 20 to 50% larger than the 'salmon' proportion of the population at the same times.

Mortality

In general, Atlantic salmon have overall mortality rates comparable to those of monosex chinooks. A reasonable expectation is 30% overall for either species. There are reports of rates as low as 15% being achieved for both species.

What makes Atlantic mortalities different from chinook mortalities is that they generally occur earlier in the production cycle. Of the 30% mortalities in the Atlantics, upwards of 20% will have occurred in the first six months in the sea. Large Atlantics are, therefore, relatively healthy.

Chinook mortalities tend to occur later in the production cycle, after more money has been invested in them. As a result, the same 30% mortality level in chinooks represents a more expensive loss.

Exceptionally high early losses in Atlantic smolts is a local phenomenon referred to as "early summer die off". It is generally considered to be a consequence of raising the S1 smolts at constant temperatures in groundwater hatcheries. It is believed by many that the lack of a "winter" is the cause of poor smolting success and generally bad health after entering the sea. The East Coast salmon farming industry does not suffer from early summer die-off, probably because they do not use groundwater hatcheries. East Coast farms routinely achieve 85% survival.

One of the other major causes of mortalities in Atlantic salmon is furunculosis. Furunculosis is a bacterial disease that can have disastrous effects if it is not treated. There are vaccines available but they are not considered to be very effective.

Furunculosis is considered to be both a freshwater and a saltwater disease. Once it has reached a farm it is hard to eliminate. Disease outbreaks are considered by many to be husbandry related, similar to vibriosis in chinooks, and related to such things as loading densities and stress.

Overall, mortality on Scottish farms has increased from an average of 15%, prior to 1988 up to 35% recently. This increase is reported to be largely due to increased furunculosis losses. These losses are not thought to be due to a more virulent strain, but rather to decreases in husbandry standards arising from rapid farm size increases without parallel skill increases.

Sea lice is also a constant threat to Atlantic salmon. Infestations can result in death, but usually cause disfigurement as portions of the fish are eaten away. Atlantics are more susceptible to sea lice than Pacific salmon.

It is argued that the Scottish and Irish salmon farming industries would not exist now if NUVAN had not been available to treat for sea lice infestations. NUVAN is considered, by some, to be an environmentally undesirable product and opposition to its use is growing.

NUVAN is banned for use in Canada so Ivermectin is used in its place. Ivermectin, apparently the most widely used veterinary drug in the world, is used on many terrestrial farm animals to treat external parasite problems. Although it is apparently not approved for routine use on fish in Canada, it is available by prescription from veterinarians and is considered to be quite effective in controlling sea lice.

Bacterial Kidney Disease (BKD), the biggest single cause of losses on chinook farms, also affects Atlantics but they are less harmed by it.

There are other diseases causing serous Atlantic salmon losses that are of concern elsewhere but not yet in B.C.. These include pancreas disease, which is taking a heavy toll in Ireland, and Hitra disease, which has been a serious problem in Norway but is now under control.

Atlantics appear to have more health problems worldwide than chinooks. The authors believe that this perception is false and arises because Atlantics have been more widely cultured for a longer period of time.

To simplify sensitivity analyses, the monthly mortality rates for the salmon and grilse segments of the population are assumed to be the same. Therefore, the analyst need only introduce monthly mortality expectations under column 8A, on page SALMON-1. When re-calculated, (keystroke F9) the program will introduce these rates into the equivalent column on the grilse production statements. The opportunity to have different mortality rates for the salmon and grilse populations remains through the use of the factors for 'Mort. Rate As % of Assumed', on VARIABLES-1 page.

Feed Costs

There is more experience worldwide in rearing Atlantics than Pacifics and therefore feed formulations for Atlantics are considered better. This implies that feed costs are lower for the same growth.

For the EXAMPLE ATLANTIC farm, conversion rates have been reduced from those used for the EXAMPLE CHINOOK farm according to reasonable industry expectations. This reduction has been introduced into the program by reducing the rate at which biological conversion rates increase (column 12A) with increasing average weights for the Atlantics relative to the chinook.

The feed conversion rates for grilse are higher (less efficient) than for salmon. This is primarily a consequence of gonadal development as they approach maturity. The grilse conversion rates have therefore been increased slightly over the levels for the salmon to reflect this.

The stock or population feed conversion rate for the EXAMPLE ATLANTIC farm (feed to flesh after losses due to mortalities) turns out to be 1.9 overall. For the EXAMPLE CHINOOK farm it turns out to be 2.11. These differences are partly due to differences in the biological conversion rate and partly due to differences in the timing of mortalities and their effect on the stock feed conversion rate.

The economic conversion rate (feed to dressed weight) for the EXAMPLE ATLANTIC farm turns out to be 2.07 while the EXAMPLE CHINOOK farm's is 2.45. The differences in the stock feed conversion rate have been exaggerated by differences in weight reductions during processing as will be discussed.

The cost of feed is assumed to be $1.15 per kilogram for the EXAMPLE ATLANTIC farm, the same as was used for the EXAMPLE CHINOOK farm.

Harvesting

The first harvest on the EXAMPLE ATLANTIC farm is of the grilse after 15 months of growth. At this time (August of year two), the average weight of the grilse (mid month, column 18, GRILSE-2 page) is 2.75 kg. This harvest was automatically triggered by setting the factor for 'Average Weight at Which Harvesting Begins', on VARIABLES-1 page, at 2.5 kilograms for the grilse (cell G14).

The EXAMPLE ATLANTIC farm harvest of grilse occurs over a two month period because the factor for 'Percentage Sold Each Month' is set at 50% (cell G16).

In practise, the timing of grilse harvests vary between regions and different stocks. In B.C., grilse are typically removed by late summer before becoming unmarketable in the fall.

The harvest weight for the grilse on the EXAMPLE ATLANTIC farm averages out to be 3 kg round weight. This works out to 2.76 kg dressed weight, or 6.1 pounds. They are, therefore, relatively large fish and receive a reasonably high price. (A price reduction because the harvest occurs during the commercial fishing season is discussed later.)

The salmon harvest on the EXAMPLE ATLANTIC farm had a hurdle weight for harvest to begin of 3.2 kilograms. This is first exceeded in the middle of October. The 'Percent Sold Each Month' factor has been set at 13% in order to have the harvest occur over an eight month period from October to May.

The average dressed weight of the salmon harvest turns out to be 4.3 kg, or 9.5 pounds. This is a respectable average that could be achieved by a well run farm in B.C. considering available grading technology and growth rates.

Exaggerations in revenues that occur because of the program's use of a single average weight when forecasting are minimized for a farm with a high average harvest weight. This is because few fish would fall in the small size categories whose price and processing cost expectations are significantly different from the average. The program is therefore more precise (but still not perfect) for farms that produce relatively large fish with only a very few under four pounds.

Processing Losses and Costs

In addition to having a smaller head to body weight ratio, Atlantic salmon are typically sold gill in. As a result, the reduction from round weight to dressed weight at processing is less for Atlantics than for Pacifics. The processing weight losses for the EXAMPLE ATLANTIC farm have been set at eight percent as opposed to 14% for the EXAMPLE CHINOOK farm.

Gutting and packaging costs have not been changed in going to the EXAMPLE ATLANTIC farm from the EXAMPLE CHINOOK farm. This implies that there would not be a discount for a farmer who harvested only large fish. However, this may not be the case since the labour requirement per pound for gutting, cleaning and packaging large fish is less than for small fish. These savings would be passed on to the farmer in a competitive market.

Although both live transport and stun and bleed techniques are widely used for both species, for the EXAMPLE ATLANTIC farm the fish are presumed to be delivered live. This reflects the most common practice for Atlantic salmon but is not necessarily an inherent difference between chinook and Atlantic farms.

The "bleeding" charges on the table of 'Processing Weight Losses and Costs' under line 11, VARIABLES-1 page, have been reduced from the charges for the EXAMPLE CHINOOK farm, which had transport costs for stunning and bleeding on-site built into them.

Overall, the charges for bleeding, gutting, and packaging (not including transport to processing) total $1.00/kg, or $0.45/lb, for the larger size categories. These charges are reasonable for the Campbell River region, and include good quality packaging.

The charge for transport of fish to processing is set at $0.35/kg (line 13, VARIABLES-2 page) bringing the overall total cost of transport to processing, processing and packaging to $1.35/kg, or $0.61/lb. Thus, the live transport option is about 20 cents more expensive than the stun and bleed option.

Sale Prices

Atlantic salmon are often assumed to receive a price premium over Pacific salmon. However, in the Western U. S. markets most often targeted by B. C. Atlantics will and do receive the same price as chinooks. Accordingly, the prices used for the EXAMPLE CHINOOK farm have been used for the EXAMPLE ATLANTIC farm.

To compensate for the use of a single weight for all grilse sales in a month (which does not consider the effect of small fish), rather than a normal distribution of weights, and in order to reflect the softening of prices during the commercial fishery (third quarter), the factor of 'Price Reduction During the Commercial Fishing Season:', under line 12 on VARIABLES-1 page has been set at 0.85 (85%). This reduces profitability of grilse sales and therefore reduces the overall average sale price for the EXAMPLE ATLANTIC farm to more modest levels.

Pen and Net Requirements

There are no technological differences between the sea pen rearing of chinooks and Atlantics. The equipment used and procedures are essentially the same even though there are subtle differences in such things as feeding frequency and timing. Atlantic salmon have traditionally been reared in smaller pens, and shallower nets than Pacifics, but examples of pens and nets of all sizes can be found on Atlantic salmon farms. Fifteen metre pens are used on the EXAMPLE ATLANTIC farm.

To reflect the general use of shallower nets for Atlantics, the 'Net Depth' factor on line 14, VARIABLES-2 page, has been set at eight metres. The result of a decrease in average net depth is an increase in the number of pens required to house the same biomass as deeper nets. However, Atlantic salmon farms normally use higher peak rearing densities than chinook farms. Peak densities of 20 to 30 kg/cubic meter are apparently routinely used in Norway. In B.C., loading densities are more moderate, with highs of 20 to 25 kg/cubic meter. For the EXAMPLE ATLANTIC farm a peak density level of 15 kg/cubic meter has been used.

A higher loading density means fewer pens are required to house the same biomass in nets of the same size. For the EXAMPLE ATLANTIC farm the reduction in net depth has been more than compensated for by the increase in loading density so that there are slightly fewer pens on the EXAMPLE ATLANTIC farm than on the EXAMPLE CHINOOK farm.

Since Atlantic salmon arrive on the farm at 45 grams, the smallest net size used to rear chinooks (6 mm) is unnecessary. The mesh cost for 6 mm nets (line 15, VARIABLES-2 page) has therefore been set at $0.01 for the EXAMPLE ATLANTIC farm.

Cost of Goods Sold

In general, the operating costs of an Atlantic farm are the same in terms of wages, fuels and medicine as for a chinook farm of the same size. The cost factors for these expenses, under line 17, VARIABLES-2 page, remain unchanged from the EXAMPLE CHINOOK farm.

The one Cost of Goods Sold expenditure that is different on the EXAMPLE ATLANTIC farm compared to the EXAMPLE CHINOOK farm is the price of smolts. B.C. apparently has the highest Atlantic salmon smolt prices in the world. In 1989, the prices ranged from $3.50 to $4.50 for S1's, depending on how early the orders were placed. The high prices are a consequence of limited supply which arises from the limited amount of eggs originally allowed in to the country and the limited amount of Atlantic salmon broodstock rearing to date.

The smolt cost for the EXAMPLE ATLANTIC farm is set at $4.10. This price level presumes that there will be a shortage for some time to come.

Fixed Costs and Capital Purchases

All 'Factors for Fixed Costs' and 'Factors for Capital Purchases' remain unchanged from the EXAMPLE CHINOOK farm.

Debt

As with the EXAMPLE CHINOOK farm, one half of all capital purchases in the first two years have been financed through five year debt. Ten year loans have then been introduced to minimize equity requirements and to bring the overall peak debt level to roughly the same level as the EXAMPLE CHINOOK farm.

To achieve an overall debt level of 35% it was necessary to borrow $200,000 and $225,000 in the first and second quarters, respectively, of year two.

RESULTS

Figure 6, overleaf, is the summary table for the EXAMPLE ATLANTIC farm. A complete printout of the model is provided as Appendix B.

The EXAMPLE ATLANTIC farm has a cost of production (F.O.B. Vancouver) of $7.25/kg ($3.30/lb). This represents the costs of a well run, reasonably lean operation in the Campbell River region, and one that has reasonable luck in terms of growth and survival.

The average sale price for the EXAMPLE ATLANTIC farm is $8.61/kg F.O.B. Vancouver. This higher sales price is due to the fact that the fish sold were on average larger than the fish sold from the EXAMPLE CHINOOK farm. Based on this average, the farm has a return (ten year IRR) on $ 1 million in invested equity of 13.6% and a net present value using a 10% discount rate of $147,000. The break even average fish price (where the ten year IRR equals zero) is estimated to be only 10% below the prices used in the model, or an average of $7.72/kilogram.

FIGURE 6: EXAMPLE ATLANTIC SUMMARY STATISTICS

DESCRIPTION OF FARM BEING MODELLED: 35% debt
75,000 atlantic salmon smolts per year on farm in Campbell River area
Uses metal pens, no feeders, accommodations and feed storage on barge
Fish are transported live to processing and gills are left in

PRODUCTION	No. smolts started	TOTAL HARVEST Round weight	TOTAL HARVEST Dressed weight	AVERAGE WEIGHT Round weight	AVERAGE WEIGHT Dressed weight	PRODUC./SMOLT Round weight	PRODUC./SMOLT Dressed weight	MORT.	FEED CONVERSION (Feed/flesh) Round	FEED CONVERSION (Feed/flesh) Dressed	AVE. SALE PRICE F.O.B. Van.	AVE. SALE PRICE Farm gate	REVENUES
SALMON	56250	183572	168886	4.71	4.33	3.26	3.00	31%	1.86	2.03	$9.00	$7.00	$1,520,561
GRILSE	18750	40388	37157	3.00	2.76	2.15	1.98	28%	2.08	2.26	$6.80	$4.96	$252,686
COMBINED	75000	223959	206043	4.27	3.93	2.99	2.75	30%	1.90	2.07	$8.61	$6.64	$1,773,248

FINANCIAL	Total cost of produc.	COST OF GOODS SOLD/kg of produc. Feed	Process.	Trans.	Total	OVERHEAD/kg of production Fixed	Interest	Dep.	Total		R.O.I.	PEAK REQUIREMENT (in millions $) Debt	Equity
$/KG	$7.25	$2.38	$1.00	$0.58	$5.85	$0.77	$0.35	$0.28	$1.40	IRR	13.62%	0.55	1.01
%/KG		32.8%	13.8%	8.1%	80.6%	10.6%	4.9%	3.9%	19.4%	NPV	146980		

PART III: SUMMARY AND CONCLUSIONS

COMPARISON OF THE EXAMPLE CHINOOK AND ATLANTIC FARMS

Figures 7 and 8, overleaf, compare critical statistics for the EXAMPLE CHINOOK and EXAMPLE ATLANTIC farms. It is important to keep in mind that these numbers represent example farms and should not be interpreted as industry averages, or as absolute differences between all dedicated chinook and dedicated Atlantic farms.

The most striking feature in the comparison of the EXAMPLE CHINOOK farm with the EXAMPLE ATLANTIC farm is the higher cost of production for the Atlantic farm ($7.25/kg versus $6.57/kg). This is a surprising result considering the advantages that the Atlantics have in terms of feed conversion, processing weight losses, and average weight at harvest.

The relatively high cost of production for Atlantics was a consequence of higher charges for live transport and higher smolt prices. If the analyst eliminates the live transport, which is only representative of typical practices and not of an inherent difference between chinook and Atlantic farming, ($0 for live transport and $0.35 for bleed and transport), then the cost of production for the EXAMPLE ATLANTIC farm declines from $7.25/kg to $7.05/kg. This still leaves a $.48 higher cost of production than for the EXAMPLE CHINOOK farm.

The primary difference between the two farms is the cost of smolts. Smolts represent only 7% of chinook production costs but 21% of Atlantic production costs. This is despite the fact that each Atlantic smolt produces an average of 2.75 kg of dressed product as opposed to 1.49 kg for the chinook. Each Atlantic smolt therefore "works harder" for the farm but not by enough to offset high smolt prices.

FIGURE 7: Comparative statistics for the EXAMPLE CHINOOK and EXAMPLE ATLANTIC farms

	Monosex Chinook	S1 Atlantics
# smolts started each year	150,000	75,000
percent mortality	29%	30%
percent jacks/grilse	3%	25%
annual production	260 tonnes	224 tonnes
av. dressed wt. of harvested fish	2.1 kg (4.6 lbs)	3.9kg (8.6lbs)
av. sale price (FOB Vancouver)	$7.46/kg	$8.61/kg
dressed wt. produced/smolt	1.49 kg	2.75 kg
dressed wt. feed conversion	2.45 : 1	2.07 : 1
peak debt level (18% interest)	36%	35%
ROI (ten year IRR)	10.5%	13.62%

FIGURE 8: Cost of Production Statistics for the EXAMPLE CHINOOK and EXAMPLE ATLANTIC farms

Cost of Goods Sold	$/kilo	$/lb	% total	$/kilo	$/lb	%total
smolts	0.47	0.21	7	1.49	0.68	21
feed	2.82	1.28	43	2.38	1.08	33
processing & packaging *	1.00	0.45	15	1.00	0.45	14
transport (feed & fish) *	0.41	0.19	6	0.58	0.26	8
other	0.43	0.20	7	0.39	0.18	5
C.O.G.S total	$5.13	$2.33	78%	$5.85	$2.66	81%
Overhead						
interest	0.35	0.16	5	0.35	0.16	5
depreciation	0.32	0.15	5	0.28	0.13	4
fixed costs	0.78	0.35	12	0.77	0.35	11
Overhead total	$1.45	$0.66	22%	$1.40	$0.64	19%
Cost of Production (F.O.B. Vancouver)	$6.57	$2.99	100%	$7.25	$3.29	100%

* Note: for chinook costs transport costs of $0.15/kg have been taken from bleeding charges and added to transport

COMPARISON OF CHINOOK AND ATLANTIC CULTURE

In changing from the EXAMPLE CHINOOK farm to the EXAMPLE ATLANTIC farm a number of advantages and disadvantages were discussed. In summary, the advantages of Atlantic salmon are:

1. A head start on growth arising from a larger smolt, which results in a wider marketing window and the sale of larger, more valuable fish.

2. Mortalities that occur earlier and are therefore cheaper.

3. Lower weight losses during processing because they are sold gill in and have a better head to body weight ratio.

4. Grilse reach reasonably large sizes before harvesting is necessary and they can be relatively easily sorted before losing value.

5. Suffer handling well and, therefore, lend themselves to size grading, eliminating sales of small fish.

6. Thrive at relatively high loading densities requiring less equipment to raise them.

The disadvantages of Atlantic salmon farming include:

1. A grilsing problem that cannot be dealt with by existing feminization technology.

2. Much more expensive smolts and generally poorer quality because of limited supply both genetically and in absolute numbers of smolts.

3. Susceptibility to sea lice, furunculosis and pancreas disease.

4. Different husbandry experience is needed to raise them.

Overall, they are more profitable to produce, but have a higher cost of production at the present time in B. C. The additional profitability arises from the ability to sell all of the fish at a larger and more valuable size.

THE BEST CASE ATLANTIC FARM EXAMPLE

One of the purposes identified by the Department of Fisheries and Oceans for this model is a policy analysis tool. The following illustration of a best case Atlantic Farm asks, and answers the question: What might be possible if the restrictions currently affecting the importation of Atlantic salmon eggs were relaxed? The author's believe that users could formulate their own "what if" questions, either corporate or regulatory, and obtain, through the use of either the EXAMPLE CHINOOK or the EXAMPLE ATLANTIC model, a satisfactory analysis of the impact of major strategic decisions.

At the present time, the importation of Atlantic salmon is restricted to prevent the introduction of disease or of wild runs of Atlantic salmon. There are, however, stocks outside of B. C. with grilsing rates of only 5% or less and growth rates that are 25% better than those currently used on B. C. farms. These kind of stocks are what Atlantic salmon farmers think of when they look ahead at Atlantic salmon in B.C..
One further change to get to the best case Atlantic farm is to eliminate early summer die-off. It is widely believed that provision of a good "winter" through the use of surface water in the hatchery results in a better smolt and the elimination of this phenomena.

If the EXAMPLE ATLANTIC farm could have purchased a $2.00 smolt, which is the price in competitive markets elsewhere, the cost of production would drop 11% to $6.48, and be slightly less than that for the chinook, even though live transports were used.

To illustrate, if Atlantics from the St. John River stock were brought to B. C. and raised in a "competitive" surface water hatchery, then expected mortalities for the B. C. farm in the first six months would drop to 5 percent from 20%, while total mortalities would drop to 19% from 30%. Smolts would be $2.50 rather than $4.10, and grilsing rates would be a maximum of 10% rather than 25%. The C.O.P., even using live transport, would then be $6.31/kg, or $2.87/lb (F.O.B. Vancouver). This represents a cost decrease of 13% for a performance level that would be considered mediocre in Atlantic Canada.

Looking to the best strains of Atlantic salmon that might be imported into B.C., then in addition to the improvements described above, the growth could be 25% better than for the EXAMPLE ATLANTIC farm, providing an average sales weight, for sales occurring at the same times as for the EXAMPLE CHINOOK farm of 5.21 kg dressed. The cost of production would be approximately $6.03/kg, or $2.74/lb, F.O.B. Vancouver. This implies that the farm would receive the highest sale prices possible and, therefore, maximize its return on investment (ROI). With this enhanced growth the ROI is estimated to be 31% based on the prices used in the EXAMPLE CHINOOK and EXAMPLE ATLANTIC models. A set of summary statistics for the best case Atlantic Farm are provided as figure 9 overleaf.

FIGURE 9: BEST CASE ATLANTIC FARM

DESCRIPTION OF FARM BEING MODELLED: BEST CASE FARM - 19% mortality, $2.5 smolt, 25% faster growth, 10% grilse
75,000 atlantic salmon smolts per year on farm in Campbell River area
Uses metal pens, no feeders, accommodations and feed storage on barge
Fish are transported live to processing and gills are left in

PRODUCTION	No. smolts started	TOTAL HARVEST Round weight	TOTAL HARVEST Dressed weight	AVERAGE WEIGHT Round weight	AVERAGE WEIGHT Dressed weight	PRODUC./SMOLT Round weight	PRODUC./SMOLT Dressed weight	MORT.	FEED CONVERSION (Feed/flesh) Round	FEED CONVERSION (Feed/flesh) Dressed	AVE. SALE PRICE F.O.B. Van.	AVE. SALE PRICE Farm gate	REVENUES
SALMON	67500	321270	295569	5.09	5.42	4.76	4.38	19%	1.85	2.02	$9.12	$7.11	$2,694,151
GRILSE	7500	23561	21676	3.75	3.45	3.14	2.89	16%	2.07	2.25	$7.23	$5.36	$156,660
COMBINED	75000	344831	317245	5.66	5.21	4.60	4.23	19%	1.87	2.03	$8.99	$6.99	$2,850,811

FINANCIAL	Total cost of produc.	COST OF GOODS SOLD/kg of produc. Feed	Process.	Trans.	Total	OVERHEAD/kg of production Fixed	Interest	Dep.	Total	R.O.I. (10 year)	PEAK REQUIREMENT (in millions $) Debt	Equity
$/KG	$6.03	$2.34	$1.00	$0.50	$4.87	$0.69	$0.23	$0.25	$1.17	IRR 30.74%	0.55	1.18
%/KG		38.7%	16.6%	9.6%	80.7%	11.5%	3.8%	4.1%	19.3%	NPV@10% 1292677		

The authors believe that the enthusiasm for farming Atlantic salmon in B.C. stems from four things. First, a knowledge of what can be achieved as illustrated in the above example. Second, the frustration of growing chinook salmon which despite significant progress still fall into size categories that are at best only marginally profitable in today's oversupplied market. Third, the challenge of a new direction. Fourth, a lack of understanding of all the problems and variables involved which may unfortunately, increase the challenge and diminish the promise.

A Pacific salmon farmer who sees Atlantic salmon being processed at a ten pound average when his or hers are only four pounds has to be intrigued. On the surface, it must look to them like Atlantics have to be much more profitable, given their large size. Based on the analyses in Parts I and II, Atlantics are more profitable, but only by a slim 3.2% return on investment.

The rearing of Atlantics at many farms is essentially an experiment to see if the claims about them are true. The problem is that the Atlantic stocks available in B.C. are poor by international standards, and a shortage of smolts has meant that some farms have received smolts that are extremely poor. There is no doubt that lack of good quality smolts will be the major limitation on the growth of Atlantic salmon culture in B. C. unless better smolts are made more widely available in the province.

EXTRAPOLATION TO THE REMAINDER OF THE INDUSTRY

The results of the analyses should not be assumed to represent average results for the industry. While every effort has been made to provide reasonable, or average expectations, the average farm cannot yet be defined.

The authors consider the results to be accurate within $\pm$ 5%, for the type of farm described (i.e. lean, in Campbell River, etc.). The lack of precision comes from simplifications within the model and imperfect cost factors.

In terms of the entire industry, the authors would venture to guess that the range in cost of productions is $\pm$ 20% of the values estimated.

ISSUES RAISED DURING STUDY INTERVIEWS

Salmon farmers interviewed for this report raised a number of areas where government policy changes could improve their ability to compete. In particular, improved access to Atlantic salmon stocks was the most important area where a change in policy would be welcomed. According to one industry spokesman: "government must appreciate that, to be on an equal footing with the rest of the world, we must be able to work with the best genetic strains." The strains in B. C. are generally regarded as amongst the poorest, yet

widespread importation of eggs is tightly controlled. Unless egg importation is simplified, B. C. farmers cannot expect to compete. Last year, Chile imported over 10 million Atlantic salmon eggs.

Several other areas where government policy changes or support could enhance industry performance were identified:

1) It is widely believed that early summer die off could be reduced by providing the natural wintering conditions available in surface water hatcheries. Further research into this problem and an expanded role for surface water hatcheries would be welcomed.

2) The accelerated approval of more therapeutants, such as Ivermectin for the treatment of sea lice, would be of tremendous help.

3) A great deal of expertise and information about salmon farming is being developed on individual farms in British Columbia. Unfortunately, much of it is not being documented and shared in a consistent manner. In addition to its significant research contribution, government could facilitate improved industry decision-making by improving technology transfer perhaps through sponsoring a forum for collecting, assimilating and disseminating existing and new information.

4) Salmon farming is a competitive industry. Policy changes that could lead to reduced costs, for example allowing floating processing plants or permitting at-sea mort silage disposal should be considered.

5) To more effectively market B.C. farmed salmon, a consistent means of identifying the various grades to consumers would be beneficial. DFO already has quality standards that are recognized as among the most stringent in the world. The role of farmed salmon in this regulatory regime needs to be clarified.

Some of these recommended policy changes are under review and will be implemented in due course. For others, including egg importation, therapeutics and overall research and technology transfer, it is important to note that government relies on the Aquaculture Industry Advisory Committee for policy advice. The policy direction provided above is not consistent with advice provided by this group.

CONCLUSION

In Part I, the changes, to practices and inputs that have occurred as a result of over a year of belt-tightening, were illustrated as the EXAMPLE CHINOOK farm model was developed. In general, the remaining farms are described as being leaner.
Overall operating performance for already well run farms, has only improved slightly in the last year. However, since most of the farms which failed recently were high cost producers, the cost of production (C.O.P.) of the industry as a whole has decreased significantly. The fact that more farms are better run, means that feed conversion rates, survival rates, and growth rates are all much better. The impact on the C. O. P. of these kinds of improvements have been much more significant than changes in the cost of inputs.

The minor decrease over the past year in the C.O.P. of the EXAMPLE CHINOOK farm is a consequence of lower capital linked expenses such as depreciation, interest and insurance. These tend to be kept to a minimum by lean management practises such as using second hand equipment. The availability of used and inexpensive equipment, therefore, is playing a much smaller role in determining the overall C.O.P. in B.C. than are the husbandry techniques employed during the use of these assets.

The STANDARD farm, described in the original report of March 1989, had an estimated C.O.P. of $6.69/kg. This was a mixed species farm in the Campbell River region that used live transports and had relatively lavish purchases. The leaner EXAMPLE CHINOOK farm of 1990 is estimated to have a C.O.P. only slightly lower; $6.57/kg. The equally lean EXAMPLE ATLANTIC farm, developed in Part II, had an estimated C.O.P. of $7.25/kg. Despite the higher cost of production, the EXAMPLE ATLANTIC farm was more profitable because it was able to sell larger fish at higher prices.

Although both EXAMPLE farms show modest returns on investment, both are vulnerable to lower prices having a margin of $.89 and $1.36 per kilogram or $.40 and $.62 for the EXAMPLE CHINOOK and EXAMPLE ATLANTIC farms respectively. For chinook, this is well within the range of price fluctuations in the past year. The wider margin and more stable prices may seem like another reason to switch to Atlantic salmon but it is important to remember that the wider margin arises from the larger size and that the assumption of parity between chinook and Atlantic salmon in the marketplace is increasingly valid. Thus, looking ahead, the price stability, in the face of growing competition from Eastern Canada and Chile may not be an advantage for the Atlantic salmon farm.

The high C.O.P. for Atlantics highlights the importance that 'Operating Costs' or 'Cost of Goods Sold changes play in determining the overall cost of production. Decreasing the smolt cost for Atlantic salmon farms could improve the result for the EXAMPLE ATLANTIC farm significantly. The high price for Atlantic smolts could be significantly decreased by allowing freer imports of eggs from Eastern Canada, Scotland or other locations. Accordingly this issue is used to illustrate the use of the model as a policy analysis or decision making tool as a "best case" Atlantic farm is developed. In addition to

supply, growth rate, grilse rate and mortality rates would also be beneficially altered with the availability of the additional genetic material. The best case Atlantic farm has a margin of $2.96.

OPPORTUNITIES FOR ADDITIONAL WORK

1. The computer program used in this report could form the basis of a more user friendly program and report which might lend itself to use as a planning tool by a broader segment of the aquaculture community. It would be relatively easy and quite beneficial to alter the program and prepare a manual that encouraged its use by a wider audience. A workshop or series of workshops could encourage its use and lead to better communication among aquaculture industry planners, both corporate and government. This forum could be used to initiate a database of production information, the lack of which is a problem in forecasting and decision making.

2. In this report there were references to reports of mortality rates as low as 15% and growth in chinooks that is as fast as that in Atlantics. There are similar reports of exceptional conversion rates and production costs of $2.00/lb. It would be of tremendous benefit if the farms that have exceptional performance could be analyzed and the results and reasons for their successes presented for others to digest. Not only would it greatly assist those farms with mediocre performance, but it would almost certainly impact on government policy making in terms of deciding where assistance is needed in the industry.

3. There is growing interest in S1 chinook smolts as a way of getting Atlantic salmon qualities in Pacific salmon smolts. In fact, S1 chinooks are becoming 'all the rage'. The problem is that there has not been a comprehensive study of the biological or economic expectations or of the experiences to date. The industry is financing a series of independent studies that need to be coalesced and directed.

The entire industry would benefit from an analysis of S1 chinook salmon economics. The data exists. Farms in New Zealand routinely use S1 smolts and farms in B.C. have used them for at least the last three years. If S1 chinook are as good as S1 Atlantics, this would impact on the urgency of Atlantic salmon egg imports and would certainly impact on decision making within the industry.

If the benefits of S1 chinook are to be realized, then an analysis of these benefits needs to be presented as soon as possible to allow farms and hatcheries to begin the two year planning schedule that is required for S1 chinook production.

4. One of the recent developments in the industry has been the release by DFO of sockeye eggs for farming purposes. The authors consider this to be an excellent research opportunity with long term potential but would caution against widespread sockeye farming until the issues of stock selection and information dissemination have been addressed.

Recently 500,000 eggs were released to the industry, from the Pitt River stock. This stock was selected because it is free of IHN disease and because surplus eggs were available. But, does the Pitt River stock have the most desirable life history for potential farming and is it capable of forming the basis of a domesticated sockeye stock?

The original report concluded that the effects of the life history of the stock being farmed was perhaps the largest single contributor to discrepancies in profitability between farms. A few months ago, the debate over Pacific salmon varieties had been reduced to a general consensus that monosex chinook were the best. The growth of interest in Atlantic salmon, S1 chinook and now sockeye has restirred the controversy and farmers are beginning to try these varieties. Because of the high cost of experimentation using even minimal production batches, it is important that good information and good stocks be as widely available as can practically be achieved, before widespread farming of these stocks begins.

A review of the results of previous sockeye farming experiments in Washington and an economic analysis of what results can reasonably be expected from sockeye farming in B.C. is required. Otherwise, there is a risk that an excellent opportunity could be a shot in the foot for an already financially weakened industry

5. The availability of more and better Atlantic salmon eggs has been identified as one of the industry's highest priorities. The current status of egg imports is that "experimental numbers will be let in". What exactly this means has not been clarified.

The authors believe that an analysis of the biological basis upon which the current regulations are founded as well as on the best way, if any, to allow the B.C. aquaculture industry access to the genetic material it needs would be highly desirable. A review and modification of the import restrictions could also help to address the concerns of opponents of increased Atlantic salmon importation.

A slightly broader look at the issue could address the Atlantic salmon broodstock industry to determine where hatchery related research could lead to the development of cheaper, better quality Atlantic smolts.

6. Dr. Craig Clarke recently completed a study of the effect of photoperiod on the control of maturation in Pacific salmon. He found that artificial day length could be used to delay maturation and therefore allow coho and chinook jacks to be marketed after the commercial fishing season in silver bright condition.

An analysis of the economic implications for farmers, of this type of research is the corollary of the use of this program in directing research efforts. In essence it is necessary to translate research findings into economic and practical terms before the benefits of the research can be fully realized.

7. An economic analysis of current and potential aquaculture regions would be very beneficial to the realignment that is beginning to take place in the industry. Some areas once looked on favourably have turned out to be poor choices for aquaculture. An analysis of the economics of farming in various regions around the coast could help to avoid costly "second generation" mistakes of both a social and financial nature.

8. Farmers would welcome a guide which assisted them in reducing exchange rate risk.

APPENDIX A

EXAMPLE CHINOOK FARM MODEL PRINTOUT

DESCRIPTION OF FARM BEING MODELLED: 36% debt
150,000 chinook smolt farm in Campbell River area
Uses metal pens, no feeders, accomodations and feed storage on barge
Fish are stun and bled on site

VARIABLES	CHINOOK	COHO
1. NUMBER OF SMOLTS STOCKED:	150000	0
2. AVE.WGT. AT WHICH HARVESTING BEGINS:	1.80	1.00
3. PERCENTAGE SOLD EACH MONTH:	17%	100%
4. GROWTH AS % OF ASSUMED:	100%	100%
5. MORT. RATE AS % OF ASSUMED:	100%	100%
6. CONVER. RATE AS % OF ASSUMED:	100%	100%
7. FEED PRICE AS % OF ASSUMED:	100%	100%
8. % DOWNGRADES AS % OF ASSUMED:	100%	100%
9. TOP GRADE'S PRICE AS % OF ASSUMED:	100%	100%
10. DOWNGRADE'S PRICE AS % OF TOPGRADE:	50%	100%

11. PROCESSING WGT. LOSSES AND COSTS PER KG OF FINISHED PRODUCT:

	wgt.loss	bleed	gutting	pack.
0 TO 1 KG	14.00%	$0.40	$0.55	$0.30
1 KG TO 2.5 KG	14.00%	$0.35	$0.50	$0.30
2.5 KG AND OVER	14.00%	$0.35	$0.50	$0.30

12. SALE PRICES FOR TOP GRADE (F.O.B. VAN., CLEANED AND PACK.):

	ACTUAL PRICES		PRICES USED	
WEIGHT CATEGORY	chinook	coho	chinook	coho
UP TO 1 KG (UNDER 2 LBS)	$3.75	$1.00	$3.75	$1.00
1 TO 2.0 KG (2 TO 4 LBS)	$5.75	$1.00	$5.75	$1.00
2 TO 3 KG (4 TO 6 LBS)	$7.70	$1.00	$7.70	$1.00
3 TO 4.5 KG (6 TO 9 LBS)	$8.80	$1.00	$8.80	$1.00
OVER 4.5 KG (OVER 9 LBS)	$9.30	$1.00	$9.30	$1.00

PRICE REDUCTION FOR SALES THAT OCCUR DURING THE COMMERCIAL FISHING SEASON: 85%

STATISTICS	CHINOOK	COHO	COMBINED
A. TOTAL HARVEST:			
round weight	259637	0	259637
dressed weight	223288	0	223288
B. AVE. HARVEST WGT.:			
round weight	2.44	ERR	2.44
dressed weight	2.10	ERR	2.10
C. PROD./SMOLT STOCKED:			
round weight	1.73	ERR	1.73
dressed weight	1.49	ERR	1.49
D. MORTALITY			
overall	29%	ERR	29%
no. pieces lost	43528	0	43528
weight lost	34115	0	34115
E. FEED CONSUMPTION:			
total consumed	546826	0	546826
total expense	$628,850	$0	$628,850
average price	$1.15	ERR	$1.15
round conv. rate	2.11	ERR	2.11
dress.conv. rate	2.45	ERR	2.45
cost/kg of dress. fish produced	$2.82	ERR	$2.82
F. PROCESSING:			
ave.wgt.reduc.	14%	ERR	14%
total cost	$256,781	$0	$256,781
cost/kg of dress. fish produced	$1.15	ERR	$1.15
G. TRANSPORT OF FEED AND FISH:			
of feed to farm	$38,278	$0	$38,278
fish to proces.	$223	$0	$223
pack.fish to Van	$20,096	$0	$20,096
cost/kg of dress. fish produced	$0.26	ERR	$0.26

VARIABLES AND STATISTICS continued

13.TRANSPORT COSTS:

	PRICE/KG	
OF FEED TO FARM:	$0.07	
OF LIVE FISH TO PROC.:	$0.00	(range of $.33 to $.44)
OF PACKAGED FISH TO VAN.:	$0.09	

(For other charges see "transport premiums" under the headings of "operating costs" and "capital purchases".)

14.PEN AND NET REQUIREMENTS AND COSTS:

PEN DIMENSIONS:	15 meters per side
NET DEPTH:	12 meters
MAX. LOADING DENSITY:	10.0 kg/cubic meter
COST OF WALKWAYS:	$300 per meter of length

15.COST OF NETTING AND CONSTRUCTION:

ave. fish weight	mesh	$/sq.m	const.factor
* (Smolts) 0 TO .050 KG	6MM	$2.40	1.60
.050 TO .200 KG	10MM	$1.35	1.75
.200 TO .750 KG	13MM	$1.30	1.50
.750 AND OVER	20MM	$1.20	1.40

* Smolt nets are 1/2 the size of other nets.

16.LOAN TIMING AND INTEREST CHARGES:

FIVE YEAR LOANS: (5 years) interest= 18.0%

YEAR ONE		YEAR TWO	
1st qtr	47000	1st qtr	0
2nd qtr	58000	2nd qtr	20000
3rd qtr	40000	3rd qtr	42000
4th qtr	3500	4th qtr	22000

TEN YEAR LOANS: (10 yrs.) interest= 18.0%

YEAR ONE		YEAR TWO	
1st qtr	0	1st qtr	0
2nd qtr	0	2nd qtr	0
3rd qtr	0	3rd qtr	200000
4th qtr	0	4th qtr	200000

17.FACTORS FOR "COSTS OF GOODS SOLD":

SMOLTS:	chinook	$0.70 @ with delivery
	coho	$1.00 @ with delivery
MEDICINE AND VET.:	$8	/tonne managed @ month
WAGES:	$1,500	/month minimum plus
	$1,800	/man/month
	0.60	tonnes/day/man
FUELS:	$5	/tonne managed @ month
TRANSPORT PREMIUM:	0%	of above

	CHINOOK	COHO	COMBINED
H. REVENUES:			
top-grade	$1,639,301	$0	$1,639,301
down-grade	$25,350	$0	$25,350
total	$1,664,651	$0	$1,664,651
ave.price (Van.)	$7.46	ERR	$7.46
ave.farm-gate	$5.45	ERR	$5.45
I. PEAK INVENT. VALUE:	$1,417,050	$0	$1,417,050
J. PEN REQUIREMENTS:			
size of square			15
number required	10.0	0.0	10.0
peak density	10.0	ERR	
total cost	$144,000	$0	$144,000
ave. cost/pen	$14,400	ERR	$14,400
K. NET REQUIREMENTS:			
depth			12
cap. in kg/net			27000
number nets req.	16.0	0.0	16.0
total cost	$46,519	$0	$46,519
average cost	$2,907	ERR	$2,907
* cost of 6mm			$3,510
cost of 10mm			$3,508
cost of 13mm			$3,071
cost of 20mm			$2,722

L. PEAK REQUIREMENTS:

Debt	$557,225
Equity	$978,828

M,N,O

	M. % EQUITY	N. REVENUES	O. PROFIT A/T
END OF YEAR 1	89%	$0	$0
YEAR 2	64%	$176,373	$0
YEAR 3	68%	$1,664,651	$166,220
YEAR 4	72%	$1,664,651	$201,245
YEAR 5	77%	$1,664,651	$222,281
YEAR 6	81%	$1,664,651	$239,178
YEAR 7	84%	$1,664,651	$251,397
YEAR 8	87%	$1,664,651	$191,967

P. RETURN ON INVESTMENT:

(Ten year I.R.R. on after tax profit.) 10.5%

18. FACTORS FOR "FIXED COSTS":

MGMT SALARIES:	$4,000 /month minimum, or
	$1,000 /per month/50000 smolts
STOCK INSURANCE:	4.5% of peak akt.value à yr.
ASSET INSURANCE:	1.5% of asset value à year
OFFICE AND TELEPHONE:	$9 /tonne managed à month
LEGAL AND ACCOUNTING:	$30,000 for start-up
	$2 /tonne managed à month
MAINTENANCE:	5% of one year old assets
MISCELLANEOUS:	20% of previous total

19. FACTORS FOR "CAPITAL PURCHASES":

ANCHORING:	$5,000 at start-up plus
	$1,500 /pen
FEED STORAGE:	$1,000 /tonne of requirement
ACCOMMODATIONS:	$15,000 /man required
DECKS AND DOCKS:	30% of feed storage costs
POWER SUPPLY:	$15,000 at start-up
FEEDERS:	$0 after one year or
	$0 /pen
BOATS AND TRUCK:	$40,000 for start-up
	$1 /tonne managed à month
MISCELLANEOUS:	$40,000 start-up plus
	10% of previous total
TRANSPORT PREMIUM:	0% of previous total
REPLACEMENTS:	10% of 3 year old assets

20. CAPITAL COST ALLOWANCE RATE: 25% one pool of all assets

21. TAX RATE: 46% of profit after losses have been carried forward

Q. COST OF PRODUCTION/KG OF PRODUCT SOLD (F.O.B. VANCOUVE
(averaged over years 3, 4 and 5)

		$/kg	% of total
COST OF GOODS SOLD:	Total	$5.13	78.0%
	Feed	$2.82	42.8%
	Processing	$1.15	17.5%
	Transports	$0.26	4.0%
OVERHEAD:	Total	$1.45	22.0%
	Fixed costs	$0.78	11.8%
	Interest	$0.35	5.3%
	Deprec.	$0.32	4.9%
TOTAL:		$6.57	

R. COST OF PRODUCTION AT THE FARM

	COMBINED
Farmgate (drsd)	$5.33
Farmgate (round)	$4.68
farm sale price	$5.45
margin	$0.77

MONOSEX CHINOOK — CHIN1 (of 4)

TIME			BIOMASS					MORTALITY				
mon.	qtr.	year	number remain. at end	real ave. weight	ave. weight used	growth (%)	biomass at end	real mortal. rate	mortal. rate used	number lost	biomass lost	% mortal. to date
Jan	1	one	0	0.000	0.000	0%	0	0.0%	0.0%	0	0	0%
Feb	1	one	0	0.000	0.000	ERR	0	0.0%	0.0%	0	0	0%
Mar	1	one	0	0.000	0.000	ERR	0	0.0%	0.0%	0	0	0%
Apr	2	one	150000	0.007	0.007	ERR	1050	0.0%	0.0%	0	0	0%
May	2	one	142500	0.013	0.013	86%	1853	5.0%	5.0%	7500	98	5%
Jun	2	one	141075	0.025	0.025	92%	3527	1.0%	1.0%	1425	36	6%
Jul	3	one	139664	0.045	0.045	80%	6285	1.0%	1.0%	1411	63	7%
Aug	3	one	136871	0.075	0.075	67%	10265	2.0%	2.0%	2793	209	9%
Sep	3	one	135502	0.110	0.110	47%	14905	1.0%	1.0%	1369	151	10%
Oct	4	one	134825	0.160	0.160	45%	21572	0.5%	0.5%	678	108	10%
Nov	4	one	134151	0.210	0.210	31%	28172	0.5%	0.5%	674	142	11%
Dec	4	one	132809	0.270	0.270	29%	35858	1.0%	1.0%	1342	362	11%
Jan	1	two	131481	0.330	0.330	22%	43389	1.0%	1.0%	1328	438	12%
Feb	1	two	128851	0.380	0.380	15%	48964	2.0%	2.0%	2630	999	14%
Mar	1	two	126919	0.420	0.420	11%	53306	1.5%	1.5%	1933	812	15%
Apr	2	two	125649	0.480	0.480	14%	60312	1.0%	1.0%	1269	609	16%
May	2	two	124393	0.550	0.550	15%	68416	1.0%	1.0%	1256	691	17%
Jun	2	two	123149	0.670	0.670	22%	82510	1.0%	1.0%	1244	833	18%
Jul	3	two	120686	0.840	0.840	25%	101376	2.0%	2.0%	2463	2069	20%
Aug	3	two	118272	1.050	1.050	25%	124186	2.0%	2.0%	2414	2534	21%
Sep	3	two	117090	1.300	1.300	24%	152216	1.0%	1.0%	1183	1538	22%
Oct	4	two	115919	1.550	1.550	19%	179674	1.0%	1.0%	1171	1815	23%
Nov	4	two	113600	1.750	1.750	13%	198801	2.0%	2.0%	2318	4057	24%
Dec	4	two	92016	2.000	2.000	14%	184033	2.0%	2.0%	2272	4544	26%
Jan	1	three	70864	2.200	2.200	10%	155901	2.0%	2.0%	1840	4049	27%
Feb	1	three	50135	2.400	2.400	9%	120323	2.0%	2.0%	1417	3401	28%
Mar	1	three	29820	2.700	2.700	13%	80513	2.0%	2.0%	1003	2707	29%
Apr	2	three	9911	3.100	3.100	15%	30725	2.0%	2.0%	596	1849	29%
May	2	three	0	3.600	3.600	16%	0	1.0%	1.0%	0	0	29%
Jun	2	three	0	4.100	4.100	14%	0	1.0%	1.0%	0	0	29%
Jul	3	three	0	4.700	4.700	15%	0	1.0%	1.0%	0	0	29%
Aug	3	three	0	5.300	5.300	13%	0	1.0%	1.0%	0	0	29%
Sep	3	three	0	6.000	6.000	13%	0	1.0%	1.0%	0	0	29%
Oct	4	three	0	6.500	6.500	8%	0	5.0%	5.0%	0	0	29%
Nov	4	three	0	7.000	7.000	8%	0	10.0%	10.0%	0	0	29%
Dec	4	three	0	7.500	7.500	7%	0	10.0%	10.0%	0	0	29%
										43528	34115	

MONOSEX CHINOOK — CHIN2 (of 4)

TIME			FEED COSTS							HARVESTING				
mon.	qtr.	year	real conver. ratio	conver. ratio used	overall conver. effic.	actual cost/ kilo	cost/ kilo used	weight consua.	month's feed cost	number sold	ave. weight	total round harvest	actual % down grades	% down grades used
Jan	1	one	0.0	0.0	ERR	$0.00	$0.00	0	$0	0	0.000	0	3.0%	3.0%
Feb	1	one	0.0	0.0	ERR	$0.00	$0.00	0	$0	0	0.000	0	3.0%	3.0%
Mar	1	one	0.0	0.0	ERR	$0.00	$0.00	0	$0	0	0.000	0	3.0%	3.0%
Apr	2	one	0.0	0.0	0.00	$0.00	$0.00	0	$0	0	0.004	0	3.0%	3.0%
May	2	one	1.3	1.3	0.63	$1.15	$1.15	1170	$1,346	0	0.010	0	3.0%	3.0%
Jun	2	one	1.3	1.3	0.96	$1.15	$1.15	2223	$2,556	0	0.019	0	3.0%	3.0%
Jul	3	one	1.3	1.3	1.12	$1.15	$1.15	3668	$4,218	0	0.035	0	3.0%	3.0%
Aug	3	one	1.4	1.4	1.26	$1.15	$1.15	5866	$6,746	0	0.060	0	3.0%	3.0%
Sep	3	one	1.4	1.4	1.32	$1.15	$1.15	6707	$7,713	0	0.093	0	3.0%	3.0%
Oct	4	one	1.4	1.4	1.35	$1.15	$1.15	9485	$10,908	0	0.135	0	3.0%	3.0%
Nov	4	one	1.5	1.5	1.39	$1.15	$1.15	10112	$11,629	0	0.185	0	3.0%	3.0%
Dec	4	one	1.5	1.5	1.43	$1.15	$1.15	12074	$13,885	0	0.240	0	3.0%	3.0%
Jan	1	two	1.5	1.5	1.46	$1.15	$1.15	11953	$13,746	0	0.300	0	3.0%	3.0%
Feb	1	two	1.6	1.6	1.51	$1.15	$1.15	10518	$12,096	0	0.355	0	3.0%	3.0%
Mar	1	two	1.6	1.6	1.54	$1.15	$1.15	8246	$9,483	0	0.400	0	3.0%	3.0%
Apr	2	two	1.6	1.6	1.56	$1.15	$1.15	12184	$14,012	0	0.450	0	3.0%	3.0%
May	2	two	1.7	1.7	1.60	$1.15	$1.15	14952	$17,195	0	0.515	0	3.0%	3.0%
Jun	2	two	1.7	1.7	1.63	$1.15	$1.15	25376	$29,183	0	0.610	0	3.0%	3.0%
Jul	3	two	1.7	1.7	1.68	$1.15	$1.15	35590	$40,929	0	0.755	0	3.0%	3.0%
Aug	3	two	1.8	1.8	1.74	$1.15	$1.15	45619	$52,462	0	0.945	0	3.0%	3.0%
Sep	3	two	1.8	1.8	1.77	$1.15	$1.15	53223	$61,206	0	1.175	0	3.0%	3.0%
Oct	4	two	1.8	1.8	1.79	$1.15	$1.15	52690	$60,594	0	1.425	0	3.0%	3.0%
Nov	4	two	1.9	1.9	1.84	$1.15	$1.15	44049	$50,656	0	1.650	0	3.0%	3.0%
Dec	4	two	1.9	1.9	1.91	$1.15	$1.15	53960	$62,054	19312	1.875	36210	3.0%	3.0%
Jan	1	three	1.9	1.9	1.95	$1.15	$1.15	34966	$40,211	19312	2.100	40555	3.0%	3.0%
Feb	1	three	2.0	2.0	2.00	$1.15	$1.15	28346	$32,597	19312	2.300	44418	3.0%	3.0%
Mar	1	three	2.0	2.0	2.04	$1.15	$1.15	30081	$34,593	19312	2.550	49246	3.0%	3.0%
Apr	2	three	2.0	2.0	2.09	$1.15	$1.15	23856	$27,434	19312	2.900	56005	3.0%	3.0%
May	2	three	2.0	2.0	2.11	$1.15	$1.15	9911	$11,398	9911	3.350	33203	3.0%	3.0%
Jun	2	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	3.850	0	3.0%	3.0%
Jul	3	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	4.400	0	3.0%	3.0%
Aug	3	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	5.000	0	3.0%	3.0%
Sep	3	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	5.650	0	3.0%	3.0%
Oct	4	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	6.250	0	3.0%	3.0%
Nov	4	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	6.750	0	3.0%	3.0%
Dec	4	three	2.0	2.0	2.11	$1.15	$1.15	0	$0	0	7.250	0	3.0%	3.0%
								=======	=======	======		=======		
							-------	546026	$628,850	106472	-------	259637		
					weighted ave.	$1.15					2.439			

MONOSEX CHINOOK CHIN3 (of 4)

TIME		PROCESSING LOSSES AND COSTS						REVENUES AND INVENTORY VALUE				
mon.	year	weight reduc.	total dressed weight	bleeding costs	gutting costs	packag. costs	total process. costs	top-grade price	revenue from top-grade	down-grade price	revenue from down-grades	market value of inventory
Jan	1 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Feb	1 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Mar	1 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Apr	2 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$3,938
May	2 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$6,947
Jun	2 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$13,226
Jul	3 one	14.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$20,033
Aug	3 one	14.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$32,721
Sep	3 one	14.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$47,510
Oct	4 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$80,895
Nov	4 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$105,644
Dec	4 one	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$134,469
Jan	1 two	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$162,708
Feb	1 two	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$183,613
Mar	1 two	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$199,897
Apr	2 two	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$226,169
May	2 two	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$256,560
Jun	2 two	14.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$309,412
Jul	3 two	14.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$323,137
Aug	3 two	14.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$606,959
Sep	3 two	14.0%	0	$0	$0	$0	$0	$4.89	$0	$2.44	$0	$743,958
Oct	4 two	14.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$1,033,125
Nov	4 two	14.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$1,143,103
Dec	4 two	14.0%	31141	$10,899	$15,570	$9,342	$35,812	$5.75	$173,687	$2.88	$2,686	$1,417,050
Jan	1 three	14.0%	34878	$12,207	$17,439	$10,463	$40,109	$7.70	$260,501	$3.85	$4,028	$1,200,434
Feb	1 three	14.0%	38199	$13,370	$19,100	$11,460	$43,929	$7.70	$285,310	$3.85	$4,412	$926,486
Mar	1 three	14.0%	42351	$14,823	$21,176	$12,705	$48,704	$7.70	$316,322	$3.85	$4,892	$619,954
Apr	2 three	14.0%	48164	$16,857	$24,082	$14,449	$55,389	$7.70	$359,739	$3.85	$5,563	$270,382
May	2 three	14.0%	28555	$9,994	$14,277	$8,566	$32,838	$8.80	$243,742	$4.40	$3,769	$0
Jun	2 three	14.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Jul	3 three	14.0%	0	$0	$0	$0	$0	$7.48	$0	$3.74	$0	$0
Aug	3 three	14.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Sep	3 three	14.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Oct	4 three	14.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Nov	4 three	14.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Dec	4 three	14.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
			223288				$256,781		$1,639,301		$25,350	$1,417,050
						proc. costs/kg =	$1.15					

MONOSEX CHINOOK CHIN4 (of 4)

TIME		PEN REQUIREMENTS AND COSTS							NET REQUIREMENTS AND COSTS					
mon.	year	1st year pens	2nd year pens	3rd year pens	no. pens req.	no. pens in use	minimum biomass density (kg/cu.m)	pen purch-ases	-- first cycle nets --- 6mm nets	10mm nets	13mm nets	20mm nets	net purchases
Jan	1 one	0.0			0.0	0.0	ERR	$0	0.0				$0
Feb	1 one	0.0			0.0	0.0	ERR	$0	0.0				$0
Mar	1 one	0.0			0.0	0.0	ERR	$0	1.0	0.0			$3,510
Apr	2 one	0.0			0.0	2.0	0.2	$36,000	1.0	0.0			$0
May	2 one	0.1			0.1	2.0	0.3	$0	1.0	0.0	0.0		$0
Jun	2 one	0.1			0.1	2.0	0.7	$0	1.0	0.0	0.0		$0
Jul	3 one	0.2			0.2	2.0	1.2	$0	1.0	0.0	0.0	0.0	$0
Aug	3 one	0.4			0.4	2.0	1.9	$0	0.0	1.0	0.0	0.0	$3,508
Sep	3 one	0.6			0.6	2.0	2.8	$0	0.0	1.0	0.0	0.0	$0
Oct	4 one	0.8			0.8	2.0	4.0	$0	0.0	1.0	0.0	0.0	$0
Nov	4 one	1.0			1.0	2.0	5.2	$0	0.0	0.0	2.0	0.0	$6,143
Dec	4 one	1.3			1.3	2.0	6.6	$0	0.0	0.0	2.0	0.0	$0
Jan	1 two	1.6	0.0		1.6	2.0	8.0	$0		0.0	2.0	0.0	$0
Feb	1 two	1.8	0.0		1.8	2.0	9.1	$0		0.0	2.0	0.0	$0
Mar	1 two	2.0	0.0		2.0	2.0	9.9	$0		0.0	2.0	0.0	$0
Apr	2 two	2.2	0.0		2.3	4.0	5.7	$27,000		0.0	3.0	0.0	$3,071
May	2 two	2.5	0.1		2.6	4.0	6.5	$0		0.0	3.0	0.0	$0
Jun	2 two	3.1	0.1		3.2	4.0	8.0	$0		0.0	4.0	0.0	$3,071
Jul	3 two	3.8	0.2		4.0	4.0	10.0	$0		0.0	0.0	4.0	$10,886
Aug	3 two	4.6	0.4		5.0	6.0	8.3	$27,000		0.0	0.0	5.0	$2,722
Sep	3 two	5.6	0.6		6.2	8.0	7.7	$27,000			0.0	6.0	$2,722
Oct	4 two	6.7	0.8		7.5	8.0	9.3	$0			0.0	7.0	$2,722
Nov	4 two	7.4	1.0		8.4	10.0	8.4	$27,000			0.0	10.0	$8,165
Dec	4 two	6.8	1.3		8.1	10.0	8.1	$0			0.0	7.0	$0
Jan	1 three	5.8	1.6	0.0	7.4	8.0	9.2	$0			0.0	6.0	$0
Feb	1 three	4.5	1.8	0.0	6.3	8.0	7.8	$0			0.0	5.0	$0
Mar	1 three	3.0	2.0	0.0	5.0	6.0	8.3	$0			0.0	3.0	$0
Apr	2 three	1.1	2.2	0.0	3.4	4.0	8.5	$0			0.0	0.0	$0
May	2 three	0.0	2.5	0.1	2.6	4.0	6.5	$0				0.0	$0
Jun	2 three	0.0	3.1	0.1	3.2	4.0	8.0	$0				0.0	$0
Jul	3 three	0.0	3.8	0.2	4.0	4.0	10.0	$0				0.0	$0
Aug	3 three	0.0	4.6	0.4	5.0	6.0	8.3	$0				0.0	$0
Sep	3 three	0.0	5.6	0.6	6.2	8.0	7.7	$0				0.0	$0
Oct	4 three	0.0	6.7	0.8	7.5	8.0	9.3	$0				0.0	$0
Nov	4 three	0.0	7.4	1.0	8.4	10.0	8.4	$0				0.0	$0
Dec	4 three	0.0	6.8	1.3	8.1	10.0	8.1	$0				0.0	$0
								$144,000	total no. nets = 16.0				$46,519
					max = 10.0	10.0							

FISHFARM MODEL (version 4)

SOURCES-1A

SOURCES AND USES OF FUNDS (all dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
PRODUCTION (in kg):	0	0	0	0	0	0	0	0	31	31	115	77	0	31	223
SOURCES OF FUNDS:															
REVENUES:															
Top-grade sales	0	0	0	0	0	0	0	0	174	174	862	603	0	174	1639
Down-grade sales	0	0	0	0	0	0	0	0	3	3	13	9	0	3	25
LOANS:															
Short term	47	58	40	4	149	0	20	42	22	84					
Long term	0	0	0	0	0	0	0	200	200	400					
TOTALS	47	58	40	4	149	0	20	242	398	660	875	613	0	176	1665
USES OF FUNDS:															
COST OF GOODS SOLD:															
Smolts		105			105		105			105		105			105
Feed	0	4	19	36	59	35	64	173	210	483	143	103	173	210	629
Medicine and vet.	0	0	0	1	1	1	2	3	5	11	4	2	3	5	14
Feed transport	0	0	1	2	4	2	4	11	13	29	9	6	11	13	38
Wages	5	5	6	8	23	8	10	20	23	60	17	13	20	23	73
Fuels	0	0	0	0	1	1	1	2	3	7	3	1	2	3	9
Fish transports x2	0	0	0	0	0	0	0	0	3	3	11	7	0	3	20
Process. and packag.	0	0	0	0	0	0	0	0	36	36	133	88	0	36	257
Transport premium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	5	114	26	47	192	47	186	209	292	734	318	326	209	292	1145
FIXED COSTS:															
Mgmt. salaries	12	12	12	12	48	12	12	12	12	48	12	12	12	12	48
Stock insurance	0	0	1	2	2	2	4	9	17	32	15	6	9	17	47
Asset insurance	0	1	1	1	3	1	1	1	2	5	1	1	1	1	5
Office + telephone	0	0	0	1	1	1	2	4	6	13	5	2	4	6	16
Legal and account.	30	0	0	0	30	0	0	1	1	3	1	0	1	1	4
Maintenance						4	4	5	6	19	6	6	6	6	23
Miscellaneous	8	3	3	3	17	4	5	6	9	24	8	5	7	9	29
TOTALS	51	16	17	19	102	25	28	39	53	144	48	33	39	52	173

SOURCES AND USES OF FUNDS continued... (all dollar values x 1000)

SOURCES-2A

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
CAPITAL PURCHASES:															
Pens	0	36	0	0	36	0	27	54	27	108	0	0	0	0	0
Nets	4	0	4	6	13	0	6	16	11	33	0	0	0	0	0
Anchoring	5	4	0	0	9	0	3	6	3	11	0	0	0	0	0
Feed storage			54		54					0					
Accomodations		50			50					0					
Decks and docks			16		16					0					
Power supply		15			15					0					
Feeders	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boats and truck	40	0	0	0	40	0	0	0	1	1	1	0	0	1	2
Misc. and farm equip	45	11	7	1	63	0	4	8	4	15	0	0	0	0	0
Transport premium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REPLACEMENTS															
TOTALS	93	116	81	7	297	0	40	84	45	169	1	0	0	1	2
INTEREST CHARGES AND PRINCIPAL REPAYMENTS:															
SHORT TERM DEBT:															
Interest	2	5	6	6	19	6	6	8	8	28	8	7	7	6	28
Principal	2	5	7	7	22	7	8	11	12	38	12	12	12	12	47
LONG TERM DEBT:															
Interest	0	0	0	0	0	0	0	9	18	27	17	17	16	16	67
Principal	0	0	0	0	0	0	0	5	10	15	10	10	10	10	40
TOTALS	4	10	13	13	41	13	15	32	48	108	47	46	45	44	181
TAXES:					0					0					0
REQUIREMENT FOR PERIOD:	106	197	98	83	484	85	249	122	40	495	-462	-208	293	213	-164
ACCUMULATED REQUIREMENT:	106	303	401	484	484	569	817	939	979	979	517	309	602	815	815
EQUITY REQUIRED:	979														

SOURCES-1B (of 2)

FOUR	FIVE	SIX	SEVEN	EIGHT
223	223	223	223	223
*****	*****	*****	*****	*****
1639	1639	1639	1639	1639
25	25	25	25	25
=====	=====	=====	=====	=====
1665	1665	1665	1665	1665
-----	-----	-----	-----	-----
105	105	105	105	105
629	629	629	629	629
14	14	14	14	14
38	38	38	38	38
73	73	73	73	73
9	9	9	9	9
20	20	20	20	20
257	257	257	257	257
0	0	0	0	0
=====	=====	=====	=====	=====
1145	1145	1145	1145	1145
-----	-----	-----	-----	-----
48	48	48	48	48
47	47	47	47	47
3	3	3	3	3
16	16	16	16	16
4	4	4	4	4
25	27	29	31	33
29	29	29	29	29
=====	=====	=====	=====	=====
172	174	176	178	180
-----	-----	-----	-----	-----

SOURCES-2B (of 2)

FOUR	FIVE	SIX	SEVEN	EIGHT
		-		
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2	2	2	2	2
0	0	0	0	0
0	0	0	0	0
30	44	40	39	39
32	46	41	41	41
18	10	3	0	0
47	47	33	0	0
59	51	44	37	30
40	40	40	40	40
163	148	84	77	70
0	0	0	0	68
-152	-151	-217	-224	-160
663	512	294	71	-90
				-- --

FISHFARM MODEL (version 4)

DEBT -A

DEBT SERVICING CALCULATIONS (all dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
FIVE YEAR LOANS															
New loans	47	58	40	4		0	20	42	22						
Principal remaining	45	97	130	126	126	119	130	162	172	172	161	149	137	126	126
Principal payment	2	5	7	7		7	8	11	12		12	12	12	12	47
Interest payment	2.1	4.6	6.2	6.0	19	5.7	6.2	7.8	8.3	28	7.8	7.2	6.7	6.2	28
DEBT SERVICE	4	10	13	13	41	13	15	18	20	66	19	19	18	18	74
TEN YEAR LOANS															
New loans	0	0	0	0		0	0	200	200						
Principal remaining	0	0	0	0	0	0	0	195	385	385	375	365	355	345	345
Principal payment	0	0	0	0		0	0	5	10		10	10	10	10	40
Interest payment	0.0	0.0	0.0	0.0	0	0.0	0.0	9.0	17.8	27	17.3	16.9	16.4	16.0	67
DEBT SERVICE	0	0	0	0	0	0	0	14	28	42	27	27	26	26	107

FOUR	FIVE	SIX	SEVEN	EIGHT
	_			
.				
79	33	0	0	0
47	47	33	0	0
18.4	10.1	2.9	0.0	0.0
=====	=====	=====	=====	=====
65	57	36	0	0
-----	-----	-----	-----	-----
305	265	225	185	145
40	40	40	40	40
58.5	51.3	44.1	36.9	29.7
=====	=====	=====	=====	=====
99	91	84	77	70
-----	-----	-----	-----	-----

FISHFARM MODEL (version 4) INCOME-A

INCOME STATEMENT (all dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
REVENUES:	0	0	0	0	0	0	0	0	176	176	875	613	0	176	1665
COST OF GOODS SOLD:	5	114	26	47	192	47	186	209	292	734	318	326	209	292	1145
GROSS PROFIT	-5	-114	-26	-47	-192	-47	-186	-209	-116	-558	557	287	-209	-116	519
OVERHEAD:															
FIXED COSTS:	51	16	17	19	102	25	28	39	53	144	48	33	39	52	173
INTEREST CHARGES:	2	5	6	6	19	6	6	17	26	55	25	24	23	22	94
C.C.A.				37	37				86	86				86	86
NET PROFIT	-57	-134	-49	-109	-350	-77	-220	-264	-281	-843	484	229	-271	-277	166
TAXES:					0					0					0
LOSSES CARRIED FWD.	-57	-192	-241	-350	-350	-428	-648	-912	-1193	-1193	-709	-479	-750	-1027	-1027
PROFIT AFTER TAX					0					0					166

INCOME-B

FOUR	FIVE	SIX	SEVEN	EIGHT
1665	1665	1665	1665	1665
1145	1145	1145	1145	1145
519	519	519	519	519
172	174	176	178	180
77	61	47	37	30
69	61	57	53	50
201	222	239	251	260
0	0	0	0	68
-825	-603	-364	-113	0
201	222	239	251	192

CAPITAL COST ALLOWANCE (C.C.A.) CALCULATIONS (All dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
Total purchases	93	209	290	297	297	297	337	421	466	466	467	467	468	468	468
New purchases	93	116	81	7	297	0	40	84	45	169	1	0	0	1	2
Old purchases					0					260					343
Undeprec. balance	93	209	290	297	260	260	300	384	429	343	344	344	344	345	259
C.C.A.	(only 1/2 of normal rate, in year of purchase)			37	37				86	86				86	86

CAPITAL-B

FOUR	FIVE	SIX	SEVEN	EIGHT
500	546	587	628	669
32	46	41	41	41
259	222	207	191	179
222	207	191	179	170
69	61	57	53	50

APPENDIX B

EXAMPLE ATLANTIC FARM MODEL PRINTOUT

::DESCRIPTION OF FARM BEING MODELLED: 35% debt
:: 75,000 atlantic salmon smolts per year on farm in Campbell River area
:: Uses metal pens, no feeders, accomodations and feed storage on barge
:: Fish are transported live to processing and gills are left in

VARIABLES	TOTAL	SALMON 75%	GRILSE 25%
1. NUMBER OF SMOLTS STOCKED:	75000	56250	18750
2. AVE.WGT. AT WHICH HARVESTING BEGINS:		3.20	2.50
3. PERCENTAGE SOLD EACH MONTH:		13%	50%
4. GROWTH AS % OF ASSUMED:		100%	100%
5. MORT. RATE AS % OF ASSUMED:		100%	100%
6. CONVER. RATE AS % OF ASSUMED:		100%	100%
7. FEED PRICE AS % OF ASSUMED:		100%	100%
8. % DOWNGRADES AS % OF ASSUMED:		100%	100%
9. TOP GRADE'S PRICE AS % OF ASSUMED:		100%	100%
10. DOWNGRADE'S PRICE AS % OF TOPGRADE:		50%	50%

11. PROCESSING WGT. LOSSES AND COSTS PER KG OF FINISHED PRODUCT:

	wgt.loss	bleed	gutting	pack.
0 TO 1 KG	8.00%	$0.25	$0.55	$0.30
1 KG TO 2.5 KG	8.00%	$0.20	$0.50	$0.30
2.5 KG AND OVER	8.00%	$0.20	$0.50	$0.30

12. SALE PRICES FOR TOP GRADE (F.O.B. VAN., CLEANED AND PACK.):

	ACTUAL PRICES		PRICES USED	
WEIGHT CATEGORY	SALMON	GRILSE	SALMON	GRILSE
UP TO 1 KG (UNDER 2 LBS)	$3.75	$3.75	$3.75	$3.75
1 TO 2.0 KG (2 TO 4 LBS)	$5.75	$5.75	$5.75	$5.75
2 TO 3 KG (4 TO 6 LBS)	$7.70	$7.70	$7.70	$7.70
3 TO 4.5 KG (6 TO 9 LBS)	$8.80	$8.80	$8.80	$8.80
OVER 4.5 KG (OVER 9 LBS)	$9.30	$9.30	$9.30	$9.30

PRICE REDUCTION FOR SALES THAT OCCUR DURING THE COMMERCIAL FISHING SEASON: 85%

STATISTICS	SALMON	GRILSE	COMBINED
A. TOTAL HARVEST:			
round weight	183572	40388	223959
dressed weight	168886	37157	206043
B. AVE. HARVEST WGT.:			
round weight	4.71	3.00	4.27
dressed weight	4.33	2.76	3.93
C. PROD./SMOLT STOCKED:			
round weight	3.26	2.15	2.99
dressed weight	3.00	1.98	2.75
D. MORTALITY			
overall	31%	20%	30%
no. pieces lost	17265	5276	22541
weight lost	14616	3468	18084
E. FEED CONSUMPTION:			
total consumed	342020	84009	426029
total expense	$393,323	$96,610	$489,934
average price	$1.15	$1.15	$1.15
round conv. rate	1.86	2.08	1.90
dress.conv. rate	2.03	2.26	2.07
cost/kg of dress. fish produced	$2.33	$2.60	$2.38
F. PROCESSING:			
ave.wgt.reduc.	8%	8%	8%
total cost	$168,886	$37,157	$206,043
cost/kg of dress. fish produced	$1.00	$1.00	$1.00
G. TRANSPORT OF FEED AND FISH:			
of feed to farm	$23,941	$5,881	$29,822
fish to proces.	$59,110	$13,005	$72,115
pack.fish to Van	$15,200	$3,344	$18,544
cost/kg of dress. fish produced	$0.58	$0.60	$0.58

13.TRANSPORT COSTS:

	PRICE/KG	
OF FEED TO FARM:	$0.07	
OF LIVE FISH TO PROC.:	$0.35	(range of $.33 to $.44)
OF PACKAGED FISH TO VAN.:	$0.09	

(For other charges see "transport premiums" under the headings of "operating costs" and "capital purchases".)

14.PEN AND NET REQUIREMENTS AND COSTS:

PEN DIMENSIONS:	15 meters per side
NET DEPTH:	8 meters
MAX. LOADING DENSITY:	15.0 kg/cubic meter
COST OF WALKWAYS:	$300 per meter of length

15.COST OF NETTING AND CONSTRUCTION:

ave. fish weight	mesh	$/sq.m	const.factor
* (Smolts) 0 TO .050 KG	6MM	$0.00	1.60
.050 TO .200 KG	10MM	$1.35	1.75
.200 TO .750 KG	13MM	$1.30	1.50
.750 AND OVER	20MM	$1.20	1.40

* Smolt nets are 1/2 the size of other nets.

16.LOAN TIMING AND INTEREST CHARGES:

FIVE YEAR LOANS: (5 years) interest= 18.0%

YEAR ONE		YEAR TWO	
1st qtr	48000	1st qtr	4000
2nd qtr	78000	2nd qtr	19000
3rd qtr	28000	3rd qtr	19000
4th qtr	2000	4th qtr	0

TEN YEAR LOANS: (10 yrs.) interest= 18.0%

YEAR ONE		YEAR TWO	
1st qtr	0	1st qtr	200000
2nd qtr	0	2nd qtr	225000
3rd qtr	0	3rd qtr	0
4th qtr	0	4th qtr	0

17.FACTORS FOR "COSTS OF GOODS SOLD":

SMOLTS:	salmon	$4.10 @ with delivery
	grilse	$4.10 @ with delivery
MEDICINE AND VET.:	$8	/tonne managed @ month
WAGES:	$1,500	/month minimum plus
	$1,800	/man/month
	0.60	tonnes/day/man
FUELS:	$5	/tonne managed @ month
TRANSPORT PREMIUM:	0%	of above

	SALMON	GRILSE	COMBINED
H. REVENUES:			
top-grade	$1,497,405	$243,539	$1,740,944
down-grade	$23,156	$9,148	$32,304
total	$1,520,561	$252,686	$1,773,248
ave.price (Van.)	$9.00	$6.80	$8.61
ave.farm-gate	$7.00	$4.96	$6.64
I. PEAK INVENT. VALUE:	$1,059,983	$222,694	$1,282,677
J. PEN REQUIREMENTS:			
size of square			15
number required	6.0	2.0	8.0
peak density	15.0	10.4	
total cost	$90,000	$36,000	$126,000
ave. cost/pen	$15,000	$18,000	$15,750
K. NET REQUIREMENTS:			
depth			8
cap. in kg/net			27000
number nets req.	9.0	5.0	14.0
total cost	$17,353	$8,970	$26,323
average cost	$1,928	$1,794	$1,880
* cost of 6mm			$1
cost of 10mm			$2,617
cost of 13mm			$2,291
cost of 20mm			$2,030

L. PEAK REQUIREMENTS:

Debt	$547,225
Equity	$1,013,100

M,N,O

	M. $ EQUITY	N. REVENUES	O. PROFIT A/T
END OF YEAR 1	88%	$0	$0
YEAR 2	66%	$719,402	$0
YEAR 3	70%	$1,773,248	$254,442
YEAR 4	74%	$1,773,248	$283,583
YEAR 5	78%	$1,773,248	$301,842
YEAR 6	82%	$1,773,248	$307,004
YEAR 7	85%	$1,773,248	$176,975
YEAR 8	88%	$1,773,248	$181,476

P. RETURN ON INVESTMENT:

(Ten year I.R.R. on after tax profit.) 13.6%

18.FACTORS FOR "FIXED COSTS":

MGMT SALARIES:	$4,000 /month minimum, or
	$1,000 /per month/50000 smolts
STOCK INSURANCE:	4.5% of peak mkt.value à yr.
ASSET INSURANCE:	1.5% of asset value à year
OFFICE AND TELEPHONE:	$9 /tonne managed à month
LEGAL AND ACCOUNTING:	$30,000 for start-up
	$2 /tonne managed à month
MAINTENANCE:	5% of one year old assets
MISCELLANEOUS:	20% of previous total

19.FACTORS FOR "CAPITAL PURCHASES":

ANCHORING:	$5,000 at start-up plus
	$1,500 /pen
FEED STORAGE:	$1,000 /tonne of requirement
ACCOMMODATIONS:	$15,000 /man required
DECKS AND DOCKS:	30% of feed storage costs
POWER SUPPLY:	$15,000 at start-up
FEEDERS:	$0 after one year or
	$0 /pen
BOATS AND TRUCK:	$40,000 for start-up
	$1 /tonne managed à month
MISCELLANEOUS:	$40,000 start-up plus
	10% of previous total
TRANSPORT PREMIUM:	0% of previous total
REPLACEMENTS:	10% of 3 year old assets

20.CAPITAL COST ALLOWANCE RATE: 25% one pool of all assets

21.TAX RATE: 46% of profit after losses have been carried forward

Q. COST OF PRODUCTION/KG OF PRODUCT SOLD (F.O.B. VANCOUVE
(averaged over years 3, 4 and 5)

		$/kg	% of total
COST OF GOODS SOLD:	Total	$5.85	80.6%
	Feed	$2.38	32.8%
	Processing	$1.00	13.8%
	Transports	$0.59	8.1%
OVERHEAD:	Total	$1.40	19.4%
	Fixed costs	$0.77	10.6%
	Interest	$0.35	4.9%
	Deprec.	$0.28	3.9%
TOTAL:		$7.25	

R. COST OF PRODUCTION AT THE FARM

	COMBINED
Farmgate (drsd)	$5.81
Farmgate (round)	$5.38
farm sale price	$6.64
margin	$1.26

ATLANTIC SALMON — SALMON1 (of 4)

TIME			BIOMASS					MORTALITY				
mon.	qtr.	year	number remain. at end	real ave. weight	ave. weight used	growth (%)	biomass at end	real mortal. rate	mortal. rate used	number lost	biomass lost	% mortal. to date
Jan	1	one	0	0.000	0.000	0%	0	0.0%	0.0%	0	0	0%
Feb	1	one	0	0.000	0.000	ERR	0	0.0%	0.0%	0	0	0%
Mar	1	one	0	0.000	0.000	ERR	0	0.0%	0.0%	0	0	0%
Apr	2	one	56250	0.045	0.045	ERR	2531	0.0%	0.0%	0	0	0%
May	2	one	53438	0.075	0.075	67%	4008	5.0%	5.0%	2813	211	5%
Jun	2	one	50766	0.130	0.130	73%	6600	5.0%	5.0%	2672	347	10%
Jul	3	one	48227	0.220	0.220	69%	10610	5.0%	5.0%	2538	558	14%
Aug	3	one	46701	0.300	0.300	36%	14034	3.0%	3.0%	1447	434	17%
Sep	3	one	45845	0.400	0.400	33%	18338	2.0%	2.0%	936	374	18%
Oct	4	one	45386	0.500	0.500	25%	22693	1.0%	1.0%	458	229	19%
Nov	4	one	45160	0.600	0.600	20%	27096	0.5%	0.5%	227	136	20%
Dec	4	one	44934	0.700	0.700	17%	31454	0.5%	0.5%	226	158	20%
Jan	1	two	44709	0.800	0.800	14%	35767	0.5%	0.5%	225	180	21%
Feb	1	two	44262	0.900	0.900	12%	39836	1.0%	1.0%	447	402	21%
Mar	1	two	43819	1.000	1.000	11%	43819	1.0%	1.0%	443	443	22%
Apr	2	two	42943	1.175	1.175	18%	50458	2.0%	2.0%	876	1030	24%
May	2	two	42084	1.400	1.400	19%	58918	2.0%	2.0%	859	1202	25%
Jun	2	two	41242	1.700	1.700	21%	70112	2.0%	2.0%	842	1431	27%
Jul	3	two	40830	2.050	2.050	21%	83702	1.0%	1.0%	412	845	27%
Aug	3	two	40422	2.500	2.500	22%	101054	1.0%	1.0%	408	1021	28%
Sep	3	two	40017	3.000	3.000	20%	120052	1.0%	1.0%	404	1213	29%
Oct	4	two	34415	3.500	3.500	17%	120453	1.0%	1.0%	400	1401	30%
Nov	4	two	29041	4.000	4.000	14%	116163	0.5%	0.5%	172	688	30%
Dec	4	two	23693	4.500	4.500	13%	106619	0.5%	0.5%	145	653	30%
Jan	1	three	18372	4.900	4.900	9%	90025	0.5%	0.5%	110	500	30%
Feb	1	three	13078	5.200	5.200	6%	68007	0.5%	0.5%	92	478	31%
Mar	1	three	7811	5.600	5.600	0%	43740	0.5%	0.5%	65	366	31%
Apr	2	three	2569	6.000	6.000	7%	15416	0.5%	0.5%	39	234	31%
May	2	three	0	6.500	6.500	0%	0	0.5%	0.5%	0	0	31%
Jun	2	three	0	7.000	7.000	0%	0	0.5%	0.5%	0	0	31%
Jul	3	three	0	7.500	7.500	7%	0	0.5%	0.5%	0	0	31%
Aug	3	three	0	8.000	8.000	7%	0	0.5%	0.5%	0	0	31%
Sep	3	three	0	8.500	8.500	6%	0	0.5%	0.5%	0	0	31%
Oct	4	three	0	9.000	9.000	6%	0	5.0%	5.0%	0	0	31%
Nov	4	three	0	9.500	9.500	6%	0	10.0%	10.0%	0	0	31%
Dec	4	three	0	10.000	10.000	5%	0	10.0%	10.0%	0	0	31%
										17265	14616	

ATLANTIC SALMON

TIME			FEED COSTS								HARVESTING				
mon.	year qtr.		real conver. ratio	conver. ratio used	overall conver. effic.	actual cost/ kilo	cost/ kilo used	weight consum.	month's feed cost		number sold	ave. weight	total round harvest	actual % down grades	% down grades used
Jan	1 one		0.0	0.0	ERR	$0.00	$0.00	0	$0		0	0.000	0	3.0%	3.0%
Feb	1 one		0.0	0.0	ERR	$0.00	$0.00	0	$0		0	0.000	0	3.0%	3.0%
Mar	1 one		0.0	0.0	ERR	$0.00	$0.00	0	$0		0	0.000	0	3.0%	3.0%
Apr	2 one		0.0	0.0	0.00	$0.00	$0.00	0	$0		0	0.023	0	3.0%	3.0%
May	2 one		1.3	1.3	0.55	$1.15	$1.15	2194	$2,523		0	0.060	0	3.0%	3.0%
Jun	2 one		1.3	1.3	0.91	$1.15	$1.15	3821	$4,394		0	0.103	0	3.0%	3.0%
Jul	3 one		1.3	1.3	1.13	$1.15	$1.15	5940	$6,831		0	0.175	0	3.0%	3.0%
Aug	3 one		1.3	1.3	1.21	$1.15	$1.15	5016	$5,768		0	0.260	0	3.0%	3.0%
Sep	3 one		1.4	1.4	1.28	$1.15	$1.15	6549	$7,532		0	0.350	0	3.0%	3.0%
Oct	4 one		1.4	1.4	1.32	$1.15	$1.15	6418	$7,381		0	0.450	0	3.0%	3.0%
Nov	4 one		1.4	1.4	1.34	$1.15	$1.15	6354	$7,307		0	0.550	0	3.0%	3.0%
Dec	4 one		1.5	1.5	1.37	$1.15	$1.15	6774	$7,790		0	0.650	0	3.0%	3.0%
Jan	1 two		1.5	1.5	1.39	$1.15	$1.15	6740	$7,751		0	0.750	0	3.0%	3.0%
Feb	1 two		1.5	1.5	1.42	$1.15	$1.15	6706	$7,712		0	0.850	0	3.0%	3.0%
Mar	1 two		1.6	1.6	1.45	$1.15	$1.15	7082	$8,144		0	0.950	0	3.0%	3.0%
Apr	2 two		1.6	1.6	1.50	$1.15	$1.15	12269	$14,110		0	1.088	0	3.0%	3.0%
May	2 two		1.6	1.6	1.55	$1.15	$1.15	15459	$17,778		0	1.288	0	3.0%	3.0%
Jun	2 two		1.7	1.7	1.61	$1.15	$1.15	21463	$24,682		0	1.550	0	3.0%	3.0%
Jul	3 two		1.7	1.7	1.64	$1.15	$1.15	24539	$28,220		0	1.875	0	3.0%	3.0%
Aug	3 two		1.7	1.7	1.67	$1.15	$1.15	31235	$35,920		0	2.275	0	3.0%	3.0%
Sep	3 two		1.7	1.7	1.69	$1.15	$1.15	34358	$39,512		0	2.750	0	3.0%	3.0%
Oct	4 two		1.8	1.8	1.74	$1.15	$1.15	36016	$41,418		5202	3.250	16907	3.0%	3.0%
Nov	4 two		1.8	1.8	1.77	$1.15	$1.15	30974	$35,620		5202	3.750	19509	3.0%	3.0%
Dec	4 two		1.8	1.8	1.79	$1.15	$1.15	26137	$30,057		5202	4.250	22110	3.0%	3.0%
Jan	1 three		1.8	1.8	1.81	$1.15	$1.15	17059	$19,618		5202	4.700	24451	3.0%	3.0%
Feb	1 three		1.9	1.9	1.83	$1.15	$1.15	10472	$12,043		5202	5.050	26271	3.0%	3.0%
Mar	1 three		1.9	1.9	1.84	$1.15	$1.15	9940	$11,430		5202	5.400	28092	3.0%	3.0%
Apr	2 three		1.9	1.9	1.86	$1.15	$1.15	5936	$6,827		5202	5.800	30173	3.0%	3.0%
May	2 three		2.0	2.0	1.86	$1.15	$1.15	2569	$2,955		2569	6.250	16058	3.0%	3.0%
Jun	2 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	6.750	0	3.0%	3.0%
Jul	3 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	7.250	0	3.0%	3.0%
Aug	3 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	7.750	0	3.0%	3.0%
Sep	3 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	8.250	0	3.0%	3.0%
Oct	4 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	8.750	0	3.0%	3.0%
Nov	4 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	9.250	0	3.0%	3.0%
Dec	4 three		2.0	2.0	1.86	$1.15	$1.15	0	$0		0	9.750	0	3.0%	3.0%
								=======	=======		======		=======		
								342020	$393,323		38985		183572		
					weighted ave.		$1.15					4.709			

ATLANTIC SALMON — SALMON3 (of 4)

TIME		PROCESSING LOSSES AND COSTS						REVENUES AND INVENTORY VALUE				
mon. qtr.	year	weight reduc.	total dressed weight	bleeding costs	gutting costs	packag. costs	total process. costs	top-grade price	revenue from top-grade	down-grade price	revenue from down-grades	market value of inventory
Jan	1 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Feb	1 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Mar	1 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Apr	2 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$9,492
May	2 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$15,029
Jun	2 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$24,748
Jul	3 one	8.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$33,819
Aug	3 one	8.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$44,734
Sep	3 one	8.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$58,452
Oct	4 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$85,100
Nov	4 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$101,609
Dec	4 one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$117,951
Jan	1 two	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$134,127
Feb	1 two	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$149,384
Mar	1 two	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$251,961
Apr	2 two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$290,133
May	2 two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$338,777
Jun	2 two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$403,145
Jul	3 two	8.0%	0	$0	$0	$0	$0	$4.89	$0	$2.44	$0	$547,826
Aug	3 two	8.0%	0	$0	$0	$0	$0	$6.55	$0	$3.27	$0	$661,400
Sep	3 two	8.0%	0	$0	$0	$0	$0	$6.55	$0	$3.27	$0	$897,992
Oct	4 two	8.0%	15555	$3,111	$7,777	$4,666	$15,555	$8.80	$132,776	$4.40	$2,053	$1,059,983
Nov	4 two	8.0%	17948	$3,590	$8,974	$5,384	$17,948	$8.80	$153,203	$4.40	$2,369	$1,022,232
Dec	4 two	8.0%	20341	$4,068	$10,170	$6,102	$20,341	$8.80	$173,630	$4.40	$2,685	$991,561
Jan	1 three	8.0%	22495	$4,499	$11,247	$6,748	$22,495	$9.30	$202,924	$4.65	$3,138	$837,234
Feb	1 three	8.0%	24170	$4,834	$12,085	$7,251	$24,170	$9.30	$218,035	$4.65	$3,372	$632,468
Mar	1 three	8.0%	25845	$5,169	$12,922	$7,753	$25,845	$9.30	$233,147	$4.65	$3,605	$406,780
Apr	2 three	8.0%	27759	$5,552	$13,880	$8,328	$27,759	$9.30	$250,417	$4.65	$3,872	$143,370
May	2 three	8.0%	14774	$2,955	$7,387	$4,432	$14,774	$9.30	$133,274	$4.65	$2,061	$0
Jun	2 three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Jul	3 three	8.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Aug	3 three	8.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Sep	3 three	8.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Oct	4 three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Nov	4 three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Dec	4 three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
			168886				$168,886		$1,497,405		$23,156	$1,059,983
					proc. costs/kg =		$1.00					

ATLANTIC SALMON — SALMON4 (of 4)

TIME		PEN REQUIREMENTS AND COSTS							NET REQUIREMENTS AND COSTS					
mon.	year	1st year pens	2nd year pens	3rd year pens	no. pens req.	no. pens in use	minimum biomass density (kg/cu.m)	pen purchases	first cycle nets 6mm nets	10mm nets	13mm nets	20mm nets	net purchases
Jan	1 one	0.0			0.0	0.0	ERR	$0	0.0				$0
Feb	1 one	0.0			0.0	0.0	ERR	$0	0.0				$0
Mar	1 one	0.0			0.0	0.0	ERR	$0	1.0	0.0			$1
Apr	2 one	0.1			0.1	2.0	0.7	$36,000	1.0	0.0			$0
May	2 one	0.1			0.1	2.0	1.1	$0	0.0	1.0	0.0		$2,617
Jun	2 one	0.2			0.2	2.0	1.8	$0	0.0	1.0	0.0		$0
Jul	3 one	0.4			0.4	2.0	2.9	$0	0.0	0.0	1.0	0.0	$2,291
Aug	3 one	0.5			0.5	2.0	3.9	$0	0.0	0.0	1.0	0.0	$0
Sep	3 one	0.7			0.7	2.0	5.1	$0	0.0	0.0	1.0	0.0	$0
Oct	4 one	0.8			0.8	2.0	6.3	$0	0.0	0.0	1.0	0.0	$0
Nov	4 one	1.0			1.0	2.0	7.5	$0	0.0	0.0	2.0	0.0	$2,291
Dec	4 one	1.2			1.2	2.0	8.7	$0	0.0	0.0	2.0	0.0	$0
Jan	1 two	1.3	0.0		1.3	2.0	9.9	$0		0.0	0.0	2.0	$4,061
Feb	1 two	1.5	0.0		1.5	2.0	11.1	$0		0.0	0.0	2.0	$0
Mar	1 two	1.6	0.0		1.6	2.0	12.2	$0		0.0	0.0	2.0	$0
Apr	2 two	1.9	0.1		2.0	2.0	14.7	$0		0.0	0.0	2.0	$0
May	2 two	2.2	0.1		2.3	4.0	8.7	$27,000		0.0	0.0	3.0	$2,030
Jun	2 two	2.6	0.2		2.8	4.0	10.7	$0		0.0	0.0	3.0	$0
Jul	3 two	3.1	0.4		3.5	4.0	13.1	$0		0.0	0.0	4.0	$2,030
Aug	3 two	3.7	0.5		4.3	6.0	10.7	$27,000		0.0	0.0	4.0	$0
Sep	3 two	4.4	0.7		5.1	6.0	12.8	$0			0.0	5.0	$2,030
Oct	4 two	4.5	0.8		5.3	6.0	13.3	$0			0.0	5.0	$0
Nov	4 two	4.3	1.0		5.3	6.0	13.3	$0			0.0	5.0	$0
Dec	4 two	3.9	1.2		5.1	6.0	12.8	$0			0.0	4.0	$0
Jan	1 three	3.3	1.3	0.0	4.7	6.0	11.6	$0			0.0	4.0	$0
Feb	1 three	2.5	1.5	0.0	4.0	4.0	15.0	$0			0.0	3.0	$0
Mar	1 three	1.6	1.6	0.0	3.2	4.0	12.2	$0			0.0	2.0	$0
Apr	2 three	0.6	1.9	0.1	2.5	4.0	9.5	$0			0.0	0.0	$0
May	2 three	0.0	2.2	0.1	2.3	4.0	8.7	$0				0.0	$0
Jun	2 three	0.0	2.6	0.2	2.8	4.0	10.7	$0				0.0	$0
Jul	3 three	0.0	3.1	0.4	3.5	4.0	13.1	$0				0.0	$0
Aug	3 three	0.0	3.7	0.5	4.3	6.0	10.7	$0				0.0	$0
Sep	3 three	0.0	4.4	0.7	5.1	6.0	12.8	$0				0.0	$0
Oct	4 three	0.0	4.5	0.8	5.3	6.0	13.3	$0				0.0	$0
Nov	4 three	0.0	4.3	1.0	5.3	6.0	13.3	$0				0.0	$0
Dec	4 three	0.0	3.9	1.2	5.1	6.0	12.8	$0				0.0	$0
								$990,000					$17,353
					max =	6.0	15.0		total no. nets =			9.0	

ATLANTIC GRILSE GRILSE1 (of 4)

TIME		BIOMASS					MORTALITY				
mon.	year	number	real	ave.	growth	biomass	real	mortal.	number	biomass	% mortal.
qtr.		remain.	ave.	weight	(%)	at end	mortal.	rate	lost	lost	to date
		at end	weight	used			rate	used			
Jan	1 one	0	0.000	0.000	0%	0	0.0%	0.0%	0	0	0%
Feb	1 one	0	0.000	0.000	ERR	0	0.0%	0.0%	0	0	0%
Mar	1 one	0	0.000	0.000	ERR	0	0.0%	0.0%	0	0	0%
Apr	2 one	18750	0.045	0.045	ERR	844	0.0%	0.0%	0	0	0%
May	2 one	17813	0.075	0.075	67%	1336	5.0%	5.0%	938	70	5%
Jun	2 one	16922	0.130	0.130	73%	2200	5.0%	5.0%	891	116	10%
Jul	3 one	16076	0.220	0.220	69%	3537	5.0%	5.0%	846	186	14%
Aug	3 one	15594	0.300	0.300	36%	4678	3.0%	3.0%	482	145	17%
Sep	3 one	15282	0.400	0.400	33%	6113	2.0%	2.0%	312	125	18%
Oct	4 one	15129	0.500	0.500	25%	7564	1.0%	1.0%	153	76	19%
Nov	4 one	15053	0.600	0.600	20%	9032	0.5%	0.5%	76	45	20%
Dec	4 one	14978	0.700	0.700	17%	10485	0.5%	0.5%	75	53	20%
Jan	1 two	14903	0.825	0.825	18%	12295	0.5%	0.5%	75	62	21%
Feb	1 two	14754	0.990	0.990	20%	14606	1.0%	1.0%	149	148	21%
Mar	1 two	14606	1.200	1.200	21%	17528	1.0%	1.0%	148	177	22%
Apr	2 two	14314	1.450	1.450	21%	20756	2.0%	2.0%	292	424	24%
May	2 two	14028	1.750	1.750	21%	24549	2.0%	2.0%	286	501	25%
Jun	2 two	13747	2.100	2.100	20%	28870	2.0%	2.0%	281	589	27%
Jul	3 two	13610	2.500	2.500	19%	34025	1.0%	1.0%	137	344	27%
Aug	3 two	6669	3.000	3.000	20%	20007	1.0%	1.0%	136	408	28%
Sep	3 two	0	3.500	3.500	17%	0	1.0%	1.0%	0	0	28%
Oct	4 two	0	4.000	4.000	14%	0	1.0%	1.0%	0	0	28%
Nov	4 two	0	4.100	4.100	2%	0	0.5%	0.5%	0	0	28%
Dec	4 two	0	4.200	4.200	2%	0	0.5%	0.5%	0	0	28%
Jan	1 three	0	4.300	4.300	2%	0	0.5%	0.5%	0	0	28%
Feb	1 three	0	4.400	4.400	2%	0	0.5%	0.5%	0	0	28%
Mar	1 three	0	4.500	4.500	2%	0	0.5%	0.5%	0	0	28%
Apr	2 three	0	5.000	5.000	11%	0	0.5%	0.5%	0	0	28%
May	2 three	0	6.000	6.000	20%	0	0.5%	0.5%	0	0	28%
Jun	2 three	0	7.000	7.000	17%	0	0.5%	0.5%	0	0	28%
Jul	3 three	0	7.500	7.500	7%	0	0.5%	0.5%	0	0	28%
Aug	3 three	0	8.000	8.000	7%	0	0.5%	0.5%	0	0	28%
Sep	3 three	0	8.500	8.500	6%	0	0.5%	0.5%	0	0	28%
Oct	4 three	0	9.000	9.000	6%	0	5.0%	5.0%	0	0	28%
Nov	4 three	0	9.500	9.500	6%	0	10.0%	10.0%	0	0	28%
Dec	4 three	0	10.000	10.000	5%	0	10.0%	10.0%	0	0	28%
									5276	3468	

ATLANTIC GRILSE — GRILSE2 (of 4)

TIME			FEED COSTS							HARVESTING				
mon.	qtr.	year	real conver. ratio	conver. ratio used	overall conver. effic.	actual cost/ kilo	cost/ kilo used	weight consum.	month's feed cost	number sold	ave. weight	total round harvest	actual % down grades	% down grades used
Jan	1	one	0.0	0.0	ERR	$0.00	$0.00	0	$0	0	0.000	0	3.0%	3.0%
Feb	1	one	0.0	0.0	ERR	$0.00	$0.00	0	$0	0	0.000	0	3.0%	3.0%
Mar	1	one	0.0	0.0	ERR	$0.00	$0.00	0	$0	0	0.000	0	3.0%	3.0%
Apr	2	one	0.0	0.0	0.00	$0.00	$0.00	0	$0	0	0.023	0	3.0%	3.0%
May	2	one	1.3	1.3	0.55	$1.15	$1.15	731	$841	0	0.060	0	3.0%	3.0%
Jun	2	one	1.3	1.3	0.91	$1.15	$1.15	1274	$1,465	0	0.103	0	3.0%	3.0%
Jul	3	one	1.4	1.4	1.17	$1.15	$1.15	2132	$2,452	0	0.175	0	3.0%	3.0%
Aug	3	one	1.4	1.4	1.27	$1.15	$1.15	1800	$2,071	0	0.260	0	3.0%	3.0%
Sep	3	one	1.5	1.5	1.35	$1.15	$1.15	2339	$2,690	0	0.350	0	3.0%	3.0%
Oct	4	one	1.5	1.5	1.40	$1.15	$1.15	2292	$2,636	0	0.450	0	3.0%	3.0%
Nov	4	one	1.6	1.6	1.44	$1.15	$1.15	2421	$2,784	0	0.550	0	3.0%	3.0%
Dec	4	one	1.6	1.6	1.47	$1.15	$1.15	2409	$2,770	0	0.650	0	3.0%	3.0%
Jan	1	two	1.7	1.7	1.51	$1.15	$1.15	3183	$3,660	0	0.763	0	3.0%	3.0%
Feb	1	two	1.7	1.7	1.56	$1.15	$1.15	4180	$4,807	0	0.908	0	3.0%	3.0%
Mar	1	two	1.8	1.8	1.62	$1.15	$1.15	5577	$6,414	0	1.095	0	3.0%	3.0%
Apr	2	two	1.8	1.8	1.68	$1.15	$1.15	6573	$7,559	0	1.325	0	3.0%	3.0%
May	2	two	1.9	1.9	1.75	$1.15	$1.15	8159	$9,383	0	1.600	0	3.0%	3.0%
Jun	2	two	1.9	1.9	1.82	$1.15	$1.15	9329	$10,728	0	1.925	0	3.0%	3.0%
Jul	3	two	2.0	2.0	1.86	$1.15	$1.15	10998	$12,648	0	2.300	0	3.0%	3.0%
Aug	3	two	2.0	2.0	1.99	$1.15	$1.15	13610	$15,652	6805	2.750	18714	3.0%	3.0%
Sep	3	two	2.1	2.1	2.08	$1.15	$1.15	7002	$8,053	6669	3.250	21674	10.0%	10.0%
Oct	4	two	2.1	2.1	2.08	$1.15	$1.15	0	$0	0	3.750	0	20.0%	20.0%
Nov	4	two	2.1	2.1	2.08	$1.15	$1.15	0	$0	0	4.050	0	50.0%	50.0%
Dec	4	two	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	4.150	0	100.0%	100.0%
Jan	1	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	4.250	0	100.0%	100.0%
Feb	1	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	4.350	0	100.0%	100.0%
Mar	1	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	4.450	0	100.0%	100.0%
Apr	2	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	4.750	0	100.0%	100.0%
May	2	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	5.500	0	100.0%	100.0%
Jun	2	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	6.500	0	100.0%	100.0%
Jul	3	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	7.250	0	100.0%	100.0%
Aug	3	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	7.750	0	100.0%	100.0%
Sep	3	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	8.250	0	100.0%	100.0%
Oct	4	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	8.750	0	100.0%	100.0%
Nov	4	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	9.250	0	100.0%	100.0%
Dec	4	three	2.0	2.0	2.08	$1.15	$1.15	0	$0	0	9.750	0	100.0%	100.0%
								84009	$96,610	13474		40388		
					weighted ave.		$1.15				2.997			

ATLANTIC GRILSE — GRILSE3 (of4)

TIME			PROCESSING LOSSES AND COSTS					REVENUES AND INVENTORY VALUE				
mon.	qtr.	year	weight reduc.	total dressed weight	bleeding costs	gutting costs	packag. costs	total process. costs	top-grade price	revenue from top-grade	down-grade price	revenue from down-grades	market value of inventory
Jan	1	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Feb	1	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Mar	1	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$0
Apr	2	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$3,164
May	2	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$5,010
Jun	2	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$8,249
Jul	3	one	8.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$11,273
Aug	3	one	8.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$14,911
Sep	3	one	8.0%	0	$0	$0	$0	$0	$3.19	$0	$1.59	$0	$19,484
Oct	4	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$28,367
Nov	4	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$33,870
Dec	4	one	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$39,317
Jan	1	two	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$46,106
Feb	1	two	8.0%	0	$0	$0	$0	$0	$3.75	$0	$1.88	$0	$54,774
Mar	1	two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$100,785
Apr	2	two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$119,346
May	2	two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$141,157
Jun	2	two	8.0%	0	$0	$0	$0	$0	$5.75	$0	$2.88	$0	$222,297
Jul	3	two	8.0%	0	$0	$0	$0	$0	$6.55	$0	$3.27	$0	$222,694
Aug	3	two	8.0%	17217	$3,443	$8,608	$5,165	$17,217	$6.55	$109,302	$3.27	$1,690	$149,650
Sep	3	two	8.0%	19940	$3,988	$9,970	$5,982	$19,940	$7.48	$134,236	$3.74	$7,458	$0
Oct	4	two	8.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Nov	4	two	8.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Dec	4	two	8.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Jan	1	three	8.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Feb	1	three	8.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Mar	1	three	8.0%	0	$0	$0	$0	$0	$8.80	$0	$4.40	$0	$0
Apr	2	three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
May	2	three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Jun	2	three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Jul	3	three	8.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Aug	3	three	8.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Sep	3	three	8.0%	0	$0	$0	$0	$0	$7.91	$0	$3.95	$0	$0
Oct	4	three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Nov	4	three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
Dec	4	three	8.0%	0	$0	$0	$0	$0	$9.30	$0	$4.65	$0	$0
				37157				$37,157		$243,539		$9,148	$222,694
						proc. costs/kg =		$1.00					

ATLANTIC GRILSE — GRILSE4 (of 4)

TIME		PEN REQUIREMENTS AND COSTS							NET REQUIREMENTS AND COSTS				
mon.	year	1st year pens	2nd year pens	3rd year pens	no. pens req.	no. pens in use	minimum biomass density (kg/cu.m)	pen purchases	-- first cycle nets --- 6mm nets	10mm nets	13mm nets	20mm nets	net purchases
qtr.													
Jan	1 one	0.0			0.0	0.0	ERR	$0	0.0				$0
Feb	1 one	0.0			0.0	0.0	ERR	$0	0.0				$0
Mar	1 one	0.0			0.0	0.0	ERR	$0	1.0	0.0			$1
Apr	2 one	0.0			0.0	2.0	0.2	$36,000	1.0	0.0			$0
May	2 one	0.0			0.0	2.0	0.4	$0	0.0	1.0	0.0		$2,617
Jun	2 one	0.1			0.1	2.0	0.6	$0	0.0	1.0	0.0		$0
Jul	3 one	0.1			0.1	2.0	1.0	$0	0.0	0.0	1.0	0.0	$2,291
Aug	3 one	0.2			0.2	2.0	1.3	$0	0.0	0.0	1.0	0.0	$0
Sep	3 one	0.2			0.2	2.0	1.7	$0	0.0	0.0	1.0	0.0	$0
Oct	4 one	0.3			0.3	2.0	2.1	$0	0.0	0.0	1.0	0.0	$0
Nov	4 one	0.3			0.3	2.0	2.5	$0	0.0	0.0	1.0	0.0	$0
Dec	4 one	0.4			0.4	2.0	2.9	$0	0.0	0.0	1.0	0.0	$0
Jan	1 two	0.5	0.0		0.5	2.0	3.4	$0		0.0	0.0	1.0	$2,030
Feb	1 two	0.5	0.0		0.5	2.0	4.1	$0		0.0	0.0	1.0	$0
Mar	1 two	0.6	0.0		0.6	2.0	4.9	$0		0.0	0.0	1.0	$0
Apr	2 two	0.8	0.0		0.8	2.0	6.0	$0		0.0	0.0	1.0	$0
May	2 two	0.9	0.0		1.0	2.0	7.2	$0		0.0	0.0	1.0	$0
Jun	2 two	1.1	0.1		1.2	2.0	8.6	$0		0.0	0.0	2.0	$2,030
Jul	3 two	1.3	0.1		1.4	2.0	10.4	$0		0.0	0.0	2.0	$0
Aug	3 two	0.7	0.2		0.9	2.0	6.9	$0		0.0	0.0	0.0	$0
Sep	3 two	0.0	0.2		0.2	2.0	1.7	$0			0.0	0.0	$0
Oct	4 two	0.0	0.3		0.3	2.0	2.1	$0			0.0	0.0	$0
Nov	4 two	0.0	0.3		0.3	2.0	2.5	$0			0.0	0.0	$0
Dec	4 two	0.0	0.4		0.4	2.0	2.9	$0			0.0	0.0	$0
Jan	1 three	0.0	0.5	0.0	0.5	2.0	3.4	$0			0.0	0.0	$0
Feb	1 three	0.0	0.5	0.0	0.5	2.0	4.1	$0			0.0	0.0	$0
Mar	1 three	0.0	0.6	0.0	0.6	2.0	4.9	$0			0.0	0.0	$0
Apr	2 three	0.0	0.8	0.0	0.8	2.0	6.0	$0			0.0	0.0	$0
May	2 three	0.0	0.9	0.0	1.0	2.0	7.2	$0				0.0	$0
Jun	2 three	0.0	1.1	0.1	1.2	2.0	8.6	$0				0.0	$0
Jul	3 three	0.0	1.3	0.1	1.4	2.0	10.4	$0				0.0	$0
Aug	3 three	0.0	0.7	0.2	0.9	2.0	6.9	$0				0.0	$0
Sep	3 three	0.0	0.0	0.2	0.2	2.0	1.7	$0				0.0	$0
Oct	4 three	0.0	0.0	0.3	0.3	2.0	2.1	$0				0.0	$0
Nov	4 three	0.0	0.0	0.3	0.3	2.0	2.5	$0				0.0	$0
Dec	4 three	0.0	0.0	0.4	0.4	2.0	2.9	$0				0.0	$0
								$36,000	total no. nets =			5.0	$8,970
				max =		2.0	10.4						

FISHFARM MODEL (version 4)

SOURCES-1A

SOURCES AND USES OF FUNDS (all dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
PRODUCTION (in kg):	0	0	0	0	0	0	0	37	54	91	73	43	37	54	206
SOURCES OF FUNDS:															
REVENUES:															
Top-grade sales	0	0	0	0	0	0	0	244	460	703	654	384	244	460	1741
Down-grade sales	0	0	0	0	0	0	0	9	7	16	10	6	9	7	32
LOANS:															
Short term	48	78	28	2	156	4	19	19	0	42					
Long term	0	0	0	0	0	200	225	0	0	425					
TOTALS	48	78	28	2	156	204	244	272	467	1186	664	390	253	467	1773
USES OF FUNDS:															
COST OF GOODS SOLD:															
Smolts		308			308		308			308		308			308
Feed	0	9	27	31	67	38	93	167	138	437	82	103	167	138	490
Medicine and vet.	0	0	0	1	1	1	2	3	4	10	3	2	3	4	12
Feed transport	0	1	2	2	4	2	6	10	8	27	5	6	10	8	30
Wages	5	5	7	7	24	8	13	19	16	56	12	13	19	16	61
Fuels	0	0	0	1	1	1	1	2	2	7	2	1	2	2	8
Fish transports x2	0	0	0	0	0	0	0	16	24	40	32	19	16	24	91
Process. and packag.	0	0	0	0	0	0	0	37	54	91	73	43	37	54	206
Transport premium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	5	323	37	41	405	51	423	256	246	975	207	495	256	246	1204
FIXED COSTS:															
Mgmt. salaries	12	12	12	12	48	12	12	12	12	48	12	12	12	12	48
Stock insurance	0	0	1	2	3	4	7	11	13	36	11	7	11	13	43
Asset insurance	0	1	1	1	4	1	1	1	1	5	1	1	1	1	4
Office + telephone	0	0	1	1	2	1	2	4	4	12	3	3	4	4	14
Legal and account.	30	0	0	0	30	0	1	1	1	3	1	1	1	1	3
Maintenance						4	4	5	5	18	5	5	5	5	19
Miscellaneous	0	3	3	3	17	5	6	7	7	24	7	6	7	7	26
TOTALS	51	16	18	19	104	27	33	40	44	145	40	34	40	43	157

FOUR	FIVE	SIX	SEVEN	EIGHT
206	206	206	206	206
*****	*****	*****	*****	*****
1741	1741	1741	1741	1741
32	32	32	32	32
=====	=====	=====	=====	=====
1773	1773	1773	1773	1773
-----	-----	-----	-----	-----
308	308	308	308	308
490	490	490	490	490
12	12	12	12	12
30	30	30	30	30
61	61	61	61	61
8	8	8	8	8
91	91	91	91	91
206	206	206	206	206
0	0	0	0	0
=====	=====	=====	=====	=====
1204	1204	1204	1204	1204
-----	-----	-----	-----	-----
48	48	48	48	48
43	43	43	43	43
3	3	2	2	2
14	14	14	14	14
3	3	3	3	3
21	23	25	26	28
26	26	26	26	26
=====	=====	=====	=====	=====
158	159	161	162	164
-----	-----	-----	-----	-----

SOURCES AND USES OF FUNDS continued... (all dollar values x 1000) SOURCES-2A

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
CAPITAL PURCHASES:															
Pens	0	72	0	0	72	0	27	27	0	54	0	0	0	0	0
Nets	0	5	5	2	12	6	4	4	0	14	0	0	0	0	0
Anchoring	5	7	0	0	12	0	3	3	0	5	0	0	0	0	0
Feed storage			36		36					0					
Accomodations		42			42					0					
Decks and docks			11		11					0					
Power supply		15			15					0					
Feeders	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Boats and truck	40	0	0	0	40	0	0	0	0	1	0	0	0	0	2
Misc. and farm equip	45	14	5	0	64	1	3	3	0	7	0	0	0	0	0
Transport premium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REPLACEMENTS															
TOTALS	90	155	57	3	304	7	37	37	0	82	0	0	0	0	2
INTEREST CHARGES AND PRINCIPAL REPAYMENTS:															
SHORT TERM DEBT:															
Interest	2	6	7	6	21	6	7	7	7	26	6	6	5	5	22
Principal	2	6	8	8	24	8	9	10	10	37	10	10	10	10	40
LONG TERM DEBT:															
Interest	0	0	0	0	0	9	19	18	18	64	17	17	17	16	67
Principal	0	0	0	0	0	5	11	11	11	37	11	11	11	11	43
TOTALS	5	12	14	14	45	28	45	46	45	164	44	43	42	41	171
TAXES:					0					0					0
REQUIREMENT FOR PERIOD:	101	428	97	75	702	-91	295	108	-132	180	-372	184	86	-136	-239
ACCUMULATED REQUIREMENT:	101	530	627	702	702	611	905	1013	882	882	509	693	778	643	643
EQUITY REQUIRED:	1013														

SOURCES-2B (of 2)

FOUR	FIVE	SIX	SEVEN	EIGHT
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2	2	2	2	2
0	0	0	0	0
0	0	0	0	0
30	36	32	32	33
32	37	34	34	34
14	7	2	0	0
40	40	18	0	0
58	51	43	35	28
43	43	43	43	43
154	140	86	78	70
0	0	10	151	155
-225	-233	-279	-144	-146
418	186	-93	-237	-383

FISHFARM MODEL (version 4)

DEBT -A

DEBT SERVICING CALCULATIONS (all dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
FIVE YEAR LOANS															
New loans	48	78	28	2		4	19	19	0						
Principal remaining	46	117	138	132	132	128	138	147	137	137	127	117	107	97	97
Principal payment	2	6	8	8		8	9	10	10		10	10	10	10	40
Interest payment	2.2	5.6	6.5	6.3	21	6.1	6.6	7.1	6.6	26	6.2	5.7	5.3	4.8	22
DEBT SERVICE	5	12	14	14	45	14	16	17	17	63	16	16	15	15	62
TEN YEAR LOANS															
New loans	0	0	0	0		200	225	0	0						
Principal remaining	0	0	0	0	0	195	409	399	388	388	378	367	356	346	346
Principal payment	0	0	0	0		5	11	11	11		11	11	11	11	43
Interest payment	0.0	0.0	0.0	0.0	0	9.0	18.9	18.4	17.9	64	17.5	17.0	16.5	16.0	67
DEBT SERVICE	0	0	0	0	0	14	30	29	29	101	28	28	27	27	109

FOUR	FIVE	SIX	SEVEN	EIGHT
58	18	0	0	0
40	40	18	0	0
14.0	6.8	1.6	0.0	0.0
=====	=====	=====	=====	=====
54	46	20	0	0
-----	-----	-----	-----	-----
303	261	218	176	133
43	43	43	43	43
58.4	50.7	43.1	35.4	27.8
=====	=====	=====	=====	=====
101	93	86	78	70
-----	-----	-----	-----	-----

FISHFARM MODEL (version 4)

INCOME-A

INCOME STATEMENT (all dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH	
REVENUES:	0	0	0	0	0	0	0	253	467	719	664	390	253	467	1773
COST OF GOODS SOLD:	5	323	37	41	405	51	423	256	246	975	207	495	256	246	1204
GROSS PROFIT	-5	-323	-37	-41	-405	-51	-423	-3	221	-256	457	-106	-3	221	569
OVERHEAD:															
FIXED COSTS:	51	16	18	19	104	27	33	40	44	145	40	34	40	43	157
INTEREST CHARGES:	2	6	7	6	21	15	26	25	25	91	24	23	22	21	89
C.C.A.				38	38				77	77				68	68
NET PROFIT	-57	-345	-61	-105	-567	-93	-482	-69	76	-568	393	-163	-65	89	254
TAXES:					0					0					0
LOSSES CARRIED FWD.	-57	-402	-463	-567	-567	-661	-1142	-1211	-1135	-1135	-742	-905	-969	-881	-881
PROFIT AFTER TAX					0					0					254

INCOME-B

FOUR	FIVE	SIX	SEVEN	EIGHT
.				
1773	1773	1773	1773	1773
1204	1204	1204	1204	1204
=====	=====	=====	=====	=====
569	569	569	569	569
-----	-----	-----	-----	-----
158	159	161	162	164
72	58	45	35	28
55	50	46	43	41
=====	=====	=====	=====	=====
284	302	317	320	336
-----	-----	-----	-----	-----
0	0	10	151	155
=====	=====	=====	=====	=====
-597	-295	0	0	0
284	302	307	177	181
=====	=====	=====	=====	=====

CAPITAL COST ALLOWANCE (C.C.A.) CALCULATIONS (All dollar values x 1000)

YEAR	ONE				TOTAL	TWO				TOTAL	THREE				TOTAL
QUARTER	1ST	2ND	3RD	4TH		1ST	2ND	3RD	4TH		1ST	2ND	3RD	4Th	
Total purchases	90	245	301	304	304	311	348	386	386	386	387	387	387	388	388
New purchases	90	155	57	3	304	7	37	37	0	82	0	0	0	0	2
Old purchases					0					266					271
Undeprec. balance	90	245	301	304	266	273	310	348	348	271	272	272	273	273	205
C.C.A.	(only 1/2 of normal rate, in year of purchase)			38	38				77	77				60	60

CAPITAL-B

FOUR	FIVE	SIX	SEVEN	EIGHT
420	457	491	525	559
32	37	34	34	34
205	182	169	156	147
182	169	156	147	140
55	50	46	43	41